VOL. XXIV NEW YORK—THURSDAY, JANUARY 26, 1911—CHICAGO No. 4

THE AUTOMOBILE

WHEN the curtain rises at the Coliseum in Chicago, on January 28, at the opening of the Tenth Annual National Automobile Show under the auspices of the National Association of Automobile Manufacturers, the patrons of the automobile industry will be greeted by the most imposing array of automobiles and accessories thereto that the world has ever known. With close to 500,000 automobiles, valued at not far from $1,500,000,000, in the keeping of the

supporters of the industry, it remains for the National Association to maintain its lead in the "world work" that it is its duty to encourage, and with upward of 378 plants devoted to the manufacture of automobiles in America, supplemented by a near approach to 11,000 establishments devoted to the manufacture of accessories, there is an irresistible force behind the promise of this epoch-making event, and with Chicago as the center of automobile manufacturing activities, coupled with her manifold of human interest attractions, it is a foregone conclusion that the automobile exhibition will be visited and the attractions offered by its efficient management, under the administration of Samuel A. Miles, will be enjoyed to the utmost.

From present indications the Coliseum will include in the estimate of its holding 86 separate makes of gasoline types of automobiles, with probably just a few under 350 separate models of cars, and this imposing array of modern automobiles will be flanked by an exhibition of at least eight different makes of electric vehicles, with upward of 32 different models to select from, and in view of the awakening interest in electric vehicle transportation it is not too much to anticipate that the offerings for this year will embody luxury and utility in keeping with the times.

The accessory makers' display will occupy a very considerable portion of the Coliseum, and the 400 or more exhibitors of the things that are used either in the building of automobiles or for their proper fitting out for service in conjunction with the accessories of comfort that automobilists prefer to indulge in, will serve as the jewels in the circle of cars, so that in the aggregate those who visit the Coliseum will be entertained and their artistic sense will be exercised, and of instruction they will doubtless have imparted to them the fullest measure.

The Coliseum Will Be Fittingly Decorated

The completion of the scheme of decoration brought with it realization of the fact that it is an enormous undertaking involving the services of six large decorating concerns, a battery of scenery artists, sculptors of national reputation, artisans from a dozen crafts, including carpenters, riggers, sailmakers, the moulders of papier mâché, and that dexterous class of workers who fashion artificial flowers, not forgetting the artificial glass display, carpetmakers and nature fakers.

It will be remembered that the last year's decorations at the Coliseum partook of the characteristics of an English garden, flanked by a dense forest, and the result was so thoroughly in keeping with the aims and aspirations of the committee that the temptation was very strong to repeat the idea, but it was feared that disappointment would result in view of the fact that the management has always kept pace with progress, and the patrons of the Chicago show have been trained up in the belief that something new and original would be given to them to mark the passing, or, better yet, the beginning, of each automobile year. It was decided, under the circumstances, to employ an art motif after Louis XIV, with all the fetching opportunities of the French idea in decoration.

As the visitors enter the Coliseum on the opening night, they will be greeted by a galaxy of 500-watt tungsten burners, casting a solid bank of light, mingling its intense rays with the falling water from a colossal fountain placed in the center of the four main sections into which the Coliseum has been divided, making each section 113 x 47 feet in area. The fountains are 30 feet wide at the base, and the water will fall from a height of 28 feet; the central column of each fountain will be illuminated, and lanterns stretching across the top will enhance the effect.

The entire roof of the building, 300 x 175 feet, has been given a stained glass effect, and the structure is supported on massive scrolls of bronze. The boldness of this effect and the general intensity of the illumination will be softened and rendered more agreeable to the sense by the fitting use of shell-shaped vases which are stretched away to right and left of the fountains; these vases are mounted on ornamental bases 10 feet high, and are illuminated. To carry out in an unbroken chain the lighting effects, ornamental lamp-posts are spaced between the vases and the lighting effect from them will come from clusters of lamps, but the glare, which might otherwise produce a rent in the general scheme, is prevented by the use of suitably contrived globes, some 12 and other 16 inches in diameter, hiding the clusters of lamps and softening the light that radiates therefrom.

Car Will Be Displayed Artistically

Each maker of automobiles is offered the widest opportunity to display his cars under the most advantageous conditions.

Cars To Be Exhibited at National Show

COLISEUM (MAIN FLOOR)

Booth No. Exhibitor	Car
A1—Winton Motor Carriage Co.	Winton
A2—Buick Motor Co.	Buick
A3—Lozier Motor Co.	Lozier
A4—Chalmers Motor Co.	Chalmers
A5—National Motor Vehicle Co.	National
A6—Pierce-Arrow Motor Car Co.	Pierce-Arrow
B1—Moline Auto Co.	Moline
B2—Hudson Motor Co.	Hudson
B3—Stevens-Duryea Co.	Stevens-Duryea
B4—Reo Motor Car Co.	Reo
B5—H. H. Franklin Mfg. Co.	Franklin
B6—Olds Motor Works	Oldsmobile
C1—Packard Motor Car Co.	Packard
C2—Thomas B. Jeffery Co.	Rambler
C3—F. B. Stearns Co.	Stearns
C4—E-M-F Co.	E-M-F
C5—Cadillac Motor Car Co.	Cadillac
C6—Peerless Motor Car Co.	Peerless
D1—Maxwell-Briscoe Motor Co.	Maxwell
D2—Willys-Overland Co.	Overland
D3—Pope Mfg. Co.	Pope-Hartford
D4—E. R. Thomas Motor Co.	Thomas
D5—Locomobile Co. of America	Locomobile
D6—Dayton Motor Car Co.	Stoddard-Dayton
E1—Woods Motor Vehicle Co.	Woods Electric
E2—Columbia Motor Car Co.	Columbia
E3—Atlas Motor Car Co.	Atlas
E4—Premier Motor Mfg. Co.	Premier
F1—Knox Automobile Co.	Knox
F2—White Company	White
F3—Matheson Automobile Co.	Matheson
F4—American Locomotive Co.	Alco
G1—Baker Motor Vehicle Co.	Baker Electric
G2—Corbin Motor Vehicle Corp.	Corbin
H1—Elmore Mfg. Co.	Elmore
H2—Haynes Automobile Co.	Haynes
J1—Metzger Motor Car Co.	Everitt
K1—Mitchell-Lewis Motor Co.	Mitchell
L1—F-A-L Motor Co.	F. A. L.

COLISEUM ANNEX (FIRST FLOOR)

M1—Brush Runabout Co.	Brush
N1—Studebaker Bros. Mfg. Co.	Studebaker-Garford
O1—Nordyke & Marmon Co.	Marmon
O2—Streator Motor Car Co.	Halladay
P1—Inter-State Auto Co.	Inter-State
Q1—Jackson Automobile Co.	Jackson
Q2—Bartholomew Co.	Glide
Q3—Babcock Electric Carriage Co.	Babcock Electric

Lamp-posts equipped with clusters of lights with the glare of the illuminating effect softened by 12-inch globes mark the entrance to the spaces all along the central way, and vases will be filled with a beautiful array of hot-house flowers so situated as to lend the impression of a certain artless abandon that will add marvelously to the sense of fitness of the scheme as a whole, serving a certain utility purpose in the plan of spacing for the display of the respective makes of automobiles. On the opposite side of the aisle entirely covering the iron girders which support the building massive pillars are placed from floor to gallery, the design being in conformity with the art motif of the fountains and in harmony with the surroundings. The gallery will have its quota of attention, thus entirely eliminating the disagreeable impression of passing from the zone of elaborate and fitting decoration to the threadbare sensation which follows a visit

behind the scenes. This completeness in the preparation of the Coliseum, thus leaving no corner in gallery or elsewhere to serve in sharp contrast with the beauty of the main idea, is at some cost in the matter of ingenuity of the decorators, and that Manager Miles is adding luster to his already well-earned laurels is adequately depicted in this plan. The annex will be fittingly improvised, carrying out the main scheme of decoration, but the First Regiment Armory will be dressed to represent the English garden and forestry as a pleasant after-thought and in memory of the splendid impression made last year in the Coliseum.

In automobiles there will be choices from the price which is well below $500 for a complete car to regular stock products extending above $5,000, and for those who wish to indulge in luxury the opportunity will be afforded to add to the price of a chassis at upward of $5,000 the cost of body work that might not be far from the same sum. From the machinery point of view purchasers will have quite a number of choices in point of detail. Those who prefer motors with gray cast-iron bases will find that this material is being used in automobiles almost without respect to price this year, on the ground, from the point of view of the designers who have departed from the use of aluminum, that the gray iron has attractions, not the least of which is a certain uniformity of strength, and if the cars are well designed and the center of gravity is low, the extra weight imposed is so situated that the good riding qualities of the automobile are improved.

In the high-powered motors, using aluminum cases, these questions of ballasting do not come up, due to the increased weight of motors and the heavier settings which have to be employed in proper keeping with the main idea. In clutch work there is still evidence of the tenacious holding to cone clutches with leather facings, but the character of the workmanship and the scheme of design is with greater uniformity as between the makes adhering to this school.

Referring to transmission gears it would seem that the three-speed selective type with direct drive on high gear is having its inning, but not to the exclusion of four-speed transmissions in the examples of automobiles that experience has shown should be so equipped. There is debatable ground between the lines drawn for the respective makes of gears, but there is no question as to the feasibility of the respective plans.

From the transmission gear to the live rear axle, and thence to the rear road wheels, utilizing a propeller shaft is the general plan of the passenger automobiles in nearly all of the sizes for this year. There are many differences in detail, and the different schools of design are adequately represented, but these are not matters which have to be discussed with a view to a possible defect, since the results obtained in the respective ways are those which the designers set out to realize, and it remains for the buyer in his own time to bow to the dictates of his own fancy.

Cars To Be Exhibited at National Show

COLISEUM (BASEMENT)

Booth No. Exhibitor.	Car.
1—Hupp-Yeats Electric Car Co.	Hupp-Yeats
2—Badger Motor Car Co.	Badger
3—Colby Motor Co.	Colby
4—Kenmore Mfg. Co.	Kenmore
5—Ohio Electric Car Co.	Electric
6—Enger Motor Car Co.	Enger
8—Cole Motor Car Co.	Cole
9—Westcott Motor Car Co.	Westcott
10—Broc Electric Vehicle Co.	Electric
11—Haberer & Co.	Cino
12—Middleby Auto Co.	Middleby
14—Ames Motor Car Co.	
15—B. C. K. Motor Car Co.	KlineKar
16—Otto Gas Engine Works	Otto
18—Zimmerman Mfg. Co.	Zimmerman

FIRST REGIMENT ARMORY (MAIN FLOOR)

A1—Hupp Motor Car Co.	Hupmobile
A2—Waverley Co.	Waverley Electric
A3—Dorris Motor Car Co.	Dorris
A4—Kissel Motor Car Co.	Kissel Kar
B1—Selden Motor Vehicle Co.	Selden
B2—W. H. McIntyre Co.	McIntyre
B3—J. I. Case Threshing Machine Co.	Case
B4—American Motor Car Co.	American
C1—Cartercar Co.	Cartercar
C2—Austin Automobile Co.	Austin
C3—Garford Co.	Garford
C4—Royal Tourist Car Co.	Royal Tourist
D1—Anderson Electric Car Co.	Detroit Electric
D2—Moon Motor Car Co.	Moon
D3—Pullman Motor Car Co.	Pullman
D4—Buckeye Mfg. Co.	Lambert
E1—Speedwell Motor Car Co.	Speedwell
E2—Fiat Auto Co.	Fiat
E3—Diamond T Motor Car Co.	Diamond T
E4—Auburn Automobile Co.	Auburn
E5—Benz Auto Import Co.	Benz
E6—Simplex Motor Car Co.	Amplex
F1—Black Mfg. Co.	Black Crow
F2—Rauch & Lang Carriage Co.	Electrics
G1—Ohio Motor Car Co.	Ohio
G2—Courier Car Co.	Stoddard "20"
G3—Midland Motor Co.	Midland
G4—Chadwick Engineering Works	Chadwick
G5—Staver Carriage Co.	Staver-Chicago
G6—Schacht Motor Car Co.	Schacht
H1—Great Western Auto Co.	Great Western

The Economic Aspect Is Brightening Up

A few months ago when financiers awakened to the fact that the automobile had such great inherent value that it absorbed attention on a widely discriminating basis and attracted money from more or less dead channels, they set up a wail that looked serious for the automobile business, owing to the vast amount of work that was being done, and to the possible effect that the contracting of credit would necessarily have upon these activities. But these bankers have since realized that if there is anything in psychology it applies to the automobile with irresistible force, for, as H. L. Hollingsworth, Professor of Psychology, Columbia University, pointed out, the logic attending rational thought is irresistible, as, for illustration, if mention is made of the word "Brooklyn," the retort comes, "Bridge," and following up this line of thought the word "automobile" suggests "pleasure." Classifying the word "pleasure," who would hazard the opinion that it is in any way related to a bad debt, the death of a fond relative, or a piano that the owner cannot play.

It is a great mistake to accept the dictum that business comes to an establishment; the reverse holds. The establishment that wants business must go after it. But when the incentive for business is set up, nor does it matter how, each business unit is a complete advertising campaign in itself, and an endless chain of business reaching through the entire fiber, from the tiller of the soil up through the industries and to the bank. The man who purchases and uses an automobile is one of the greatest benefactors in our industrial life; business animation is the direct result of his purchase, since the automobile must be constructed at the cost of labor and material, and other labor is engaged in the fabrication of that material, and railway transportation intervenes, takings the material from its various sources of the raw supply so that the natural resources of the country are drawn upon, energized and worked.

Fortunately, the industrial situation is readjusting itself to the improvements wrought by the coming of the automobile. The very farmers who once upon a time made bold to proclaim their enmity to the emancipator of the horse are now its staunch adherents, and the problem of the farm is being solved by the simple expedient which is represented in the building of good roads and the introduction of the means for transportation which enables the farmer to imbibe in social intercourse and the destruction of that peculiar and harassing state of isolation that drove the younger generation into the haunts of industrial slavery to the abandonment of the source of the nation's basic supply of wealth and prosperity.

S. T. Davis, Jr., Member Exec. Com. A. L. Pope, Member Exec. Com. Thomas Henderson, Member Exec. Com.

N. A. A. M. Show

NOW that the Tenth Annual National Automobile Show is the biggest thing in the immediate future of the automobile industry, the association that conducts the great Chicago display draws to itself an added interest. The show is fostered and managed by the National Association of Automobile Manufacturers, the senior trade organization of American motordom.

This history of the association was briefly outlined in the columns of THE AUTOMOBILE recently, but the show that opens Saturday looms up in such an important light that another article dealing with one of the branches of activity associated with the organization will not be out of place.

The N. A. A. M. conducts the national show each year. It has departments and committees that scan the trend of trade and a dozen other interesting phases of the motor industry. It maintains a legal department and is a leading spirit in the national movement for good roads. Aside from all its other enterprises the association has organized a traffic department.

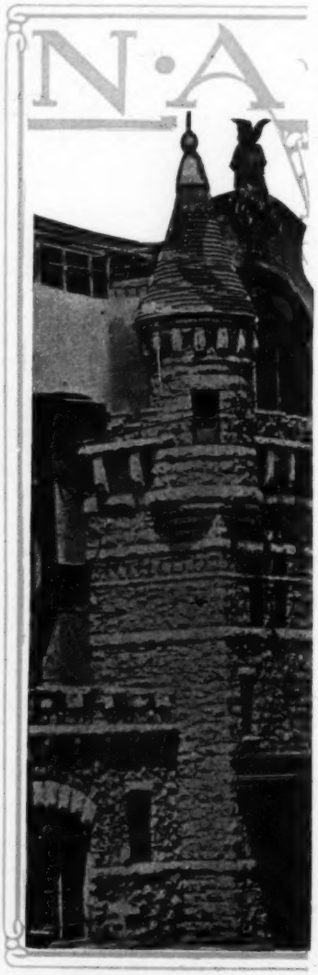
The records of the railroads show that something over 100,000 carloads of automobiles were shipped over their lines during 1910. The indications for this year are for a business of approximately the same volume. The shipment of raw material for building the cars; the local traffic that has resulted from the operation of automobile factories and from the building of the factories themselves; the shipment of coal for producing power at the factories and other railroad business arising directly from the manufacture of automobiles foot up an immense amount of freight revenue that is too shadowy in its limits to be definitely estimated.

All told, the annual business for the railroads created by the automobile is a material factor in the prosperity of the country. The freight rates for shipping completed automobiles are high on account of the high valuation of the freight. In the first place it is possible to ship only two big automobiles in a freight car. Supposing that the weight of each automobile is 4,000 pounds, the total load of the car would be only 8,000 pounds. The capacity of the car may be several times that figure, but nothing more can be shipped in it. The theory of the railroads is that they take an extraordinary risk in automobile shipments on account of the value of the machines, but the records show that since the early days of the industry the freight claims for damage in shipment are so small in volume that they are scarcely worth considering. This is particularly true when the high revenue from this class of freight is considered.

When the automobile first assumed a position as a factor in railroad shipment it was classed along with horse-drawn vehicles. In that day the manufacturers knew little about packing and preparing their product for transportation by freight, and naturally enough the railroads knew as little about handling it en route and at the terminals.

In those pioneer days there was more or less loss occasioned by injury during shipment, but as the art progressed so did the methods of transportation, and to-day automobiles can be shipped by freight with only an infinitesimal chance of damage.

The problem of transporting this immense volume of freight belongs to the railroads, but the problem is many-phased, and for the convenience and protection of the shippers the National Association of Automobile Manufacturers conducts a well-equipped traffic department, the duty of which is to conserve the interests of the members and also those of a long list of companies associated with the licensed body. James S. Marvin is general traffic manager, with offices at 7 East Forty-second street, New York City. This department is vested in the N. A. A. M., but it includes most of the A. L. A. M. companies and has within its jurisdiction the vast majority of American motordom. It was formed several years ago,



THE AUDITORIUM AND THE

H. O. Smith, Secretary James S. Marvin, General Traffic Manager William E. Metzger, Vice-President

GIVING AN IDEA OF THE ACTIVITIES OF THE ORGANIZATION WHICH IS MANAGING THE BIG WESTERN EXHIBITION

C. C. Hildebrand, Second Vice-President

Benjamin Briscoe, Third Vice-President

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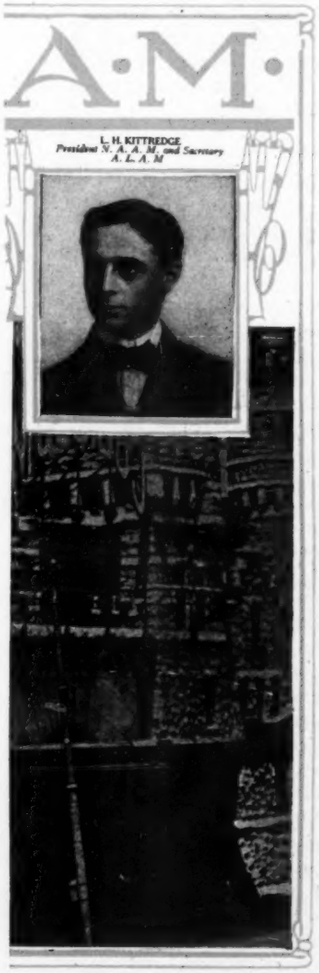
when the industry as a whole began to assume commanding proportions.

One of the good works accomplished by the department was the suggestion that was made by it to the railroads to prepare cars for shipping automobiles. It was found that the 5-foot doors used almost universally at that time were too narrow to admit large automobiles, and at the suggestion of the traffic departments the railroads increased the size of the side doors. This was done without calling for special rolling stock equipment. The method in some cases was merely to cut out boards.



PRESIDENT OF THE N.A.A.M.

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The companies of the A. L. A. M. who are associated with the traffic department are as follows:

Acme Motor Car Co., American Loco. Co. (Auto Dept.), American Motor Car Co., Anderson Carriage Co., Apperson Bros. Auto Co., Atlas Motor Car Co., Austin Automobile Co., Autocar Co., Babcock Electric Carriage Co., Baker Motor Vehicle Co., Bartholomew Co., The, Brush Runabout Co., Buckeye Mfg. Co., Buick Motor Co., Cadillac Motor Car Co., Cartercar Co, Chadwick Engineering Works, Chalmers Motor Co., Columbia Motor Car Co., Commercial Motor Co., Corbin Motor Vehicle Corp., Courier Car Co., Dayton Motor Car Co., Dorris Motor Car Co., Duryea, Chas. E., Elmore Mfg. Co., Everitt-Metzger-Flanders Co., Ewing Automobile Co., Ford Motor Co., Franklin Mfg. Co., H. H., Fuller Buggy Co., Garford Co., Grabowsky Power Wagon Co., Haynes Automobile Co., Hewitt Motor Co., Hudson Motor Car Co., Hupp Motor Car Co., Inter-State Automobile Co., Jackson Automobile Co., Jeffrey Co., Thos. B., The, Kissel Motor Car Co., Knox Automobile Co., Locomobile Co., of America, Lozier Motor Co., The, McIntyre Co., W. H., Mack Bros. Motor Car Co., Marion Motor Car Co., Marquette Motor Co., Matheson Motor Car Co., Maxwell-Briscoe Motor Co., Mercer Automobile Co., Metzger Motor Car Co., Midland Motor Co., Mitchell-Lewis Motor Co., Moline Automobile Co., Moon Motor Car Co., Mora Co., National Motor Vehicle Co., Nordyke & Marmon Co., Oakland Motor Car Co., Ohio Motor Car Co., Olds Motor Works, Overland Auto Co., Packard Motor Car Co., Palmer & Singer Mfg. Co., Peerless Motor Car Co., Pierce-Arrow Motor Car Co., Pierce Motor Co., Pope Mfg. Co., The, Premier Motor Mfg. Co., Pullman Motor Car Co., Randolph Motor Car Co., Rapid Motor Vehicle Co., Regal Motor Car Co., Reliance Motor Truck Co., Reo Motor Car Co., Royal Tourist Car Co., Sampson Mfg. Co., Alden, Selden Motor Vehicle Co., Simplex Automobile Co., Simplex Motor Car Co., Smith Automobile Co., Speedwell Motor Car Co., Stearns Co., The F. B. Stevens-Duryea Co., Studebaker Automobile Co., Thomas Motor Co., E. R., Waltham Mfg. Co., Waverley Co., The, White Co., The, Willys-Overland Co., The, Winton Motor Carriage Co., Woods Motor Vehicle Co.

S. D. Waldron, Member Exec. Com.

Windsor T. White, Member Exec. Com.

S. A. Miles, General Manager

Résumé of the Year's Work

FRUIT OF THE AUTOMOBILE YEAR; WHAT THE MAKERS OF AUTOMOBILES WERE DOING; IDEAS WHICH PROVED TO BE EFFICACIOUS; REFORMS THAT WERE UNDERTAKEN; PROMISES MADE GOOD; RECAPITULATIONS OF STATISTICS; THE TREND IN THE INDUSTRY

GOOD progress has been made in the several directions that are known to the ways of the automobile, and the start along the right road is so well beaten that there is no power that can compel a retrograde movement. There are, no doubt, quite a number of unsettled points; they may take a turn that is not now contemplated, but the turn, if it is seriously entertained, will be along lines for honest progress, and the man who must pay the toll is to be the judge in the long run. It is to Col. Charles Clifton that we owe a most excellent view of the situation; it was at the banquet of the M. & A. M., at the Waldorf-Astoria, during the address when Col. Clifton said: "The young man must carry the load, * * * efficiency is the keynote; *take efficiency home with you* * * * *."*

That the young man must carry the load is but another way of saying that the young man will take the brunt of it, and that too, whether we like it or not; it is the young man who likes strenuosity; he goes in for work, if it is hard, and reward is reflected in that famous quotation: "Give me liberty, or give me death." The older man is bent upon dodging death by the tranquillity cure, and as for liberty, he has had his quota. So, as Col. Clifton stated, it is to the young man that the automobile business must look for the energy; he is the draught animal that will have to draw the chariot over the rough road that leads through the valley and on, along rugged mountainsides, beating a path over foot-hills, and in the final charge, when we take the flag and plant it upon the height, who, but the young man will trample down opposition, rent in twain the obstacles, and gather victory in the embrace of the giant who is but the embodiment of the human race?

"Take efficiency home with you!" Where would we get efficiency but from the old man? It is his stock in trade. When the young man takes up the burden; when he goes forth to conquer, it is with the lever of efficiency that he hopes to pry off the cover of opposition, and it is the old campaigner who furnishes that lever, and its name is experience: its token is efficiency.

The Automobile Is Gaining in Worth

Eleven years of organized activity; over a decade of concerted action; the gathering of a force, called by the name experience, is having its bearing upon the whole undertaking, and the automobiles which are now to be had at reasonable prices are the product of that accumulation, representing the old man's experience, the young man's efficiency, and last, but not least, the progressiveness of the users of automobiles.

There is one point that has never been brought out in all its force, relative to the difference between the automobile idea as it is recognized in America, and as it obtains in England and on the Continent. That we, here, are forging ahead, is recognized. Why? Why not?

Is it a breach of citizenship in America for a workman to purchase and use an automobile? Is it a crime for a man of high standing, in America, to purchase and ride in a runabout? Are we hidebound? Is our social structure so full of prejudice that we bite off our nose to spite our face? Do we stand in our own light? Are we so selfish that we desire to restrict our neighbors unless they are in a position to loan us money? Must we reek with the order of attar of roses at $20 per ounce before we acquire the right to purchase and use an automobile?

Are we to be despised for our democracy? But if it is this very national characteristic—the idea of tolerating comfort and ease of living as it comes to our brothers in the enjoyment of citizenship—that is giving to us a great advantage, it will be but a matter of a few years when we will serve as the shrine to be worshipped by the nations of earth whose standard is based upon pounds, shillings and pence, in quantity sufficient to make it possible for the possessors to pay for the gallons of printer's ink that must be spilled on paper to print a pedigree of the character that will live in history.

Automobiles Will Have Universal Application

The great success of the automobile industry in America is absolutely due to its utility in the hands of the man who must make a living for himself and his family, and that, too, under far more strenuous conditions than ever before. Since it is good citizenship to be a good provider, it is also preferred practice, in America, to employ the most efficient implements, and as an implement there is nothing that can be regarded as more efficacious than the automobile.

The first estimate of the automobile was that it was the toy of the rich. This idea came with automobile importations. The idea was on a par with the automobiles that came along with it. We now know better than to tie up either to the toys that come across, or to the idea that the "idle rich" are to have a monopoly of the good things that mechanics make, that engineers contrive, and that capital lends countenance to.

In the course of time, as designers made efficient headway, things did take a turn for the better and it was sound practice anon to buy an automobile to use in business pursuits. The doctor who formerly practiced his profession over four square miles of sparsely settled territory, found that he could more efficiently cover 16 square miles of territory, and that he could minister to the wants of the sick on a better basis. Why should the doctor take even a moment to consider the first cost of the automobile that would "square" his efficiency?

The contractor who eked out a precarious existence in a small way, soon determined that he had but to purchase and use an automobile in order to grow and become a contractor of greater importance. Those who desired the services of a man of this stamp were more inclined to give the work to the "automobile equipped" contractor, and those who extended credit for materials were more liberal in their methods, for, as they might readily observe, the man who can get around with material, keep a sharp eye upon the progress of work, and accomplish the completion of undertakings upon time, was the one that should be given preference.

About the Other Half of the Automobile

Good roads, so called, as they appeared to the automobilist of a decade ago, were paths of tramped-down earth; they were the good roads that men drove horse-drawn vehicles over; these men talked about their love for horse-flesh; they used the whip; it was a regular product of commerce; it was so important an article of commerce, the whip, that a whip trust was formed, and it thrived and prospered.

What a love is this! How good were the roads! May we

not say that the automobile will render the "Society for the Prevention of Cruelty to Animals" *hors de combat?*

It is the man who wielded the whip, who found that he could purchase a whip for a dollar, and that a good road would eat a hole in his pocketbook, who loved the horse, who still wields the whip, but it is being snapped around the ears of the automobilist—the horse is but a memory; a loving memory to this man; he remembers that whips were cheap. We cannot blame the whipmaker for whining; his ally, the whip user—the lover of horseflesh, is whining also; let him have a good cry—they do say that it is medicine for the "ladies."

Will we weep with the man who so loved horses that he supported an opulent whip trust by his purchases of the means for caressing the objects of his love and affection, or will we build good roads now that we have automobiles to use instead of horses, knowing full well, as we do, that automobiles would not respond to the crack of the whip? But shall we respond to the crack of the whip? Are we to be downed by the whip-wielder? Is he the man who is to tell us how to build and maintain good roads?

At the last meeting of the Society of Automobile Engineers, which was held in New York City early in January, the subject of good roads was taken up and handled; a paper was read by Logan Waller Page, Director of Public Roads, Department of Agriculture. The paper, which was reproduced in the pages of THE AUTOMOBILE, was not more interesting than the discussion which followed its presentation. Director Page indicated in the paper that he is bent upon contending with the "clashing" interests.

During the discussion it was clearly shown that it is not knowledge, but action, that is most in need. In the fining of automobilists—and every tax is a fine if it discriminates against the man who is assessed—it is the aim of the horseman to place all the burden upon the automobilist, and, as Mr. Page said, "there is still much opposition against the automobile, especially in the rural districts." According to this idea, the whole State of New Jersey is a rural district. In the meantime, in New Jersey, some politicians are in the throes of the last battle for existence for them; the farmers are awakening to the fact that they have been exploited.

At all events, during the discussion President H. E. Coffin, of the S. A. E., said that "it is time that engineers be consulted," referring to the basis of taxation, but Mr. Page maintained that it would be difficult to get those who are in charge of the situation to appreciate the fine points of engineering, to understand the technical terms; to know what it means when it is said that a proper basis for taxation is represented in the formula:

$$T=M\ V^2/k.$$

When,

M = mass (weight of the vehicle in pounds);

V^2 = velocity of the vehicle in feet per second (or equivalent);

k = a constant (reducing the taxation to dollars per year).

If it is admitted that this formula is the one to employ in the determination of the equity of taxation, if it is also true that men who now hold office cannot comprehend the situation, is it not self-evident that they should retire? Are they to be retained for no better reason than that they do not know how to do their work properly? If they admit that the right method of proceeding is too complicated, do they think that the farmer is such a lunkhead that he will appreciate the play called "dog in the manger"?

We are told that there is a practical situation that ever confronts politicians; that they must always be practical (they must not offend the ghost in his walk) in whatever they do. If the farmer is the ghost, that is, if the farmer has to pay for good roads, which, by the way, is not altogether true, but assuming that he does have to tote some of the load, then, if he says, "I do not want good roads—I desire to remain poor instead," why should the cost of a manger be saddled upon either the farmer or the automobilist?

But if the automobilist is to be taxed for the cost of road-building; if he is to be the "goat"; if he must be exploited; why should he have to accept the poor result that is all that he can possibly expect from men who say, "we do not understand technical formulæ; we do not think that farmers can be educated up to it."

Automobilists, every one of them engaged in some business or other, must hire men to do their work of one kind or another. Is there one of them who would engage a man to act as cashier, for illustration, were he to proclaim that he cannot count? Would any of these automobilists hire a man to run their engine and look after their steam boiler were he to say, "I do not know how to run a steam boiler?"

Regarding Methods of Automobile Taxation

That the automobile should pay its just share of all taxation is self-evident; but that it should pay all the taxes is a libel upon the intelligence of even an immigrant, who can scarcely be expected to understand the principle of operation of a free government. Just to show how it would work out were the principle of the MV^2/k formula adapted for automobiles and animal-drawn vehicles the tabulation as follows is given:

TABLE SHOWING TAXATION OF AUTOMOBILES AND OTHER VEHICLES

Type of Vehicle	Net Weight of Vehicle in Tons	Carrying Capacity in Tons	Maximum Speed Allowed by Statute	Cost of Annual License in Dollars
Gasoline	1	1	15	$19.36
Steam	1	1	15	$19.36
Electric	1	1	15	$19.36
Horse	1	1	15	$19.36
Gasoline	2	2	15	$38.72
Steam	2	2	15	$38.72
Electric	2	2	15	$38.72
Horse	2	2	15	$38.72
Gasoline	3	3	15	$58.08
Steam	3	3	15	$58.08
Electric	3	3	15	$58.08
Horse	3	3	15	$58.08

k=100,000, assumed for purposes of illustration.

As the tabulation shows, for a given privilege, there should be a given charge. The roadbed is not affected because the vehicle is of any particular generic type; it depreciates by service, and this service must be measured from the point of view of the work that may be imposed upon the road.

There is a difference, in some respects, between horse-drawn vehicle service and automobile service. The horse "chisels" up the roadbed—the automobile does not. On the other hand, the automobile is propelled by traction at less than 100 per cent. efficiency of the transfer of the energy required at the point of road contact of the tractor wheels, and this is detrimental to the road; but it does not exceed the depreciation that is directly traced to the effect of the hammer-blows of the horse's hoofs. Let us conclude, for the time, that it is an even balance between horses and automobiles.

There is one other point that cannot be ignored. Any law that is placed upon the statute books, if it is in violation of Nature's laws, will not remain thereon—it cannot; it will merely serve as a monument to the stupidity of, first, the community that elects the framer of the law to office, and second, of the legislator who does not know enough to take cognizance of Nature's Immutable Laws.

It is not the claim here that all the laws of Nature are to be so readily interpreted that there is no chance of a mistake, but it is possible to point out that men who say they cannot understand the technical questions involved in the automobile and the road, should not be placed in a position to prevent men who are versed in Nature's ways from progressing toward the inevitable end as fast as possible.

It might be said of automobiles that they can be made to go faster than can horse-drawn vehicles. The law says, "they shall not go faster than a certain speed." It cannot be maintained that a man should be charged a fee for the express purpose of violating the law, and, under the circumstances, nothing remains but to fix the value of V^2 according to law. The maximum allowable speed, under the law, is the proper speed to consider, and, since horse-drawn vehicles can make even a greater speed than the law allows for automobiles, what remains but to fix the license charge on a basis of equity; what right has the legislature to discriminate?

Picking the Trend Is a Difficult Task

When the small boy is tucked away safely in his snowy-white cot at night, and his fond Mamma lingers around until sleep overtakes him, he has a penchant for story-telling, and the chances are that he will present a brave and manly front, for him—he might even do a little bragging. But when slumber overtakes the brave little chap, and the lights are put out, should he awaken in the night, he forgets all about bravery and of bragging he will have none of it. He is mostly concerned about the creaking noises that seem to be so prevalent in the depth of night, and doubts arise as to the reality of things as he views them. The automobile business is like the small boy in many ways; when the statistician essays to tell us how big we have grown, and how important we are, he selects the most favorable conditions, and if he brags a little, he is but human. But when the lights go out and darkness settles down, the brave statistician finds his courage oozing out, and he doubts the soundness of his own views.

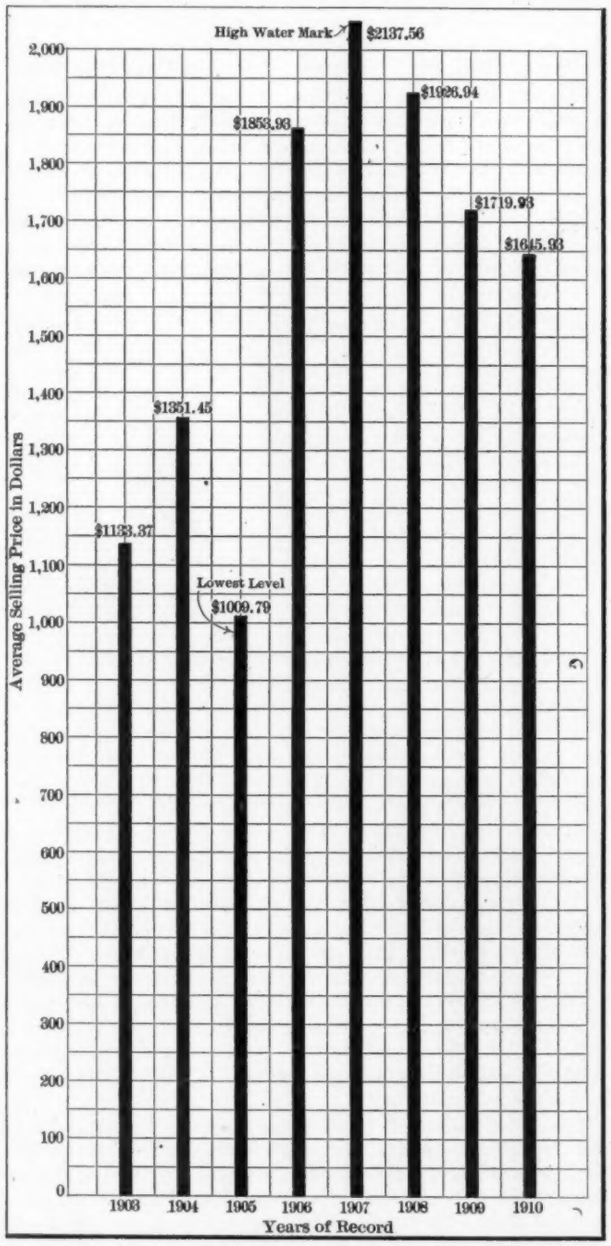


Chart depicting the average prices of automobiles for the several years beginning with 1903

It may not be too much to say that he, the statistician, is no more in doubt of the soundness of the statistics he so diligently gathers than are those who are amused by his romances, and who know better than to take them too seriously. That the progress which has been made by the automobile art beggars description is an accepted view; it simply means that there is utility in the idea; there was a definite need; it has been satisfied up to the limit of the ability of makers of automobiles to cope with an enormous demand.

When the wonder wears off, and the statistician goes back to a well-earned hibernation, the presentation of review figures of the industry will be on a more conservative basis, and those who have to make up their minds as to the best thing to do financially will be unhampered by figures that have no meaning excepting to cast a doubt, due to their ponderous array, and to the fact that it is impossible to prove whether or not they are right or wrong. It was James G. Blaine who said: "Facts are stubborn things, and the hard figures of arithmetic are not to be overcome by airy figures of speech; the truth remains." The idea so clearly depicted in this quotation is true, despite the attempt on the part of automobile statisticians to destroy the value of figures by quoting such an array of them that they are past believing. In all fairness, the average statistician is a mighty poor guesser; he likes to be in the light, and he knows perfectly well that it would cost a hundred thousand dollars, or more, perhaps, to prove that what he states to be a fact has not even the right to be laid upon a shelf alongside of the remains of a dust-covered fallacy.

It is possible to doubt the soundness of a bank that is presided over by a banker who takes any stock whatever in the wild talk that passes current among the blabbers of the industry, and the men whose interest in the building of automobiles is reduced to such a low level that they have to brag about what they do. Fortunately, the automobile industry is big enough to support a crop of men who are so sure that a million dollars will never overtake them, that they can talk in big figures without the fear that it will ever become their task to spend the income. In the meantime, there are advantages to be gained by looking back over the doings of the men who have built up the automobile industry in something over a decade; it is worth while to point to the part of their work that will ever remain as their monument, and it is as an object lesson to see the small measure of activity that anchors doings to a fixed spot in the commercial world.

The Rise and Fall of the Tide of Prices

When the first automobile was registered in the office of the Secretary of State in New York, on January 1, 1901, it was a relatively poor piece of automobile work that could be had for $5,000. It was an easy matter to go forth and expend $10,000 for a car that could be duplicated to-day for one-tenth of this sum, and the majority of the automobiles running on the streets

of New York between 1901 and 1902 cost more than $10,000 apiece. But so rapidly did the influence of American shop methods make its mark upon the automobile business that the average price for the automobiles sold in 1903 was $1,133.37.

Prognosticators Became as Busy as Bees

If the statisticians of the present day offend the sensibilities of those who retain a vague memory of truth, they are no more profuse in their ways than were the prognosticators of the early days. In 1903, when the prices of automobiles fell rapidly to a little over $1,000 average, hundreds of men made the bold statement that cars would ultimately be sold for a few hundred dollars apiece.

It is fortunate for the users of automobiles in particular that these prognosticators fell short of their mark something like $1,500, for instead of automobiles being a drug on the market at $200 apiece, the average price for 1910, notwithstanding the actual delivery of 187,000 automobiles, was $1,645.93. Just how the average price of cars ranged up and down from year to year is shown by the varying lengths of heavy lines in the chart contrived for this purpose and presented here, but it cannot be shown that quantity production has had any effect that should be regarded as marked upon the average price of the cars made.

Why is it that the prices of automobiles are maintained with great stability in the face of the fact that the capacity for production in America has increased by leaps and bounds from year to year, and the exportation of American cars has been as a mere bagatelle? Is it not an absolute sign of the stability of the industry? May we not regard it as the true and only pyrometer for the purpose of discerning the state of the automobile atmosphere? What other means have we at hand that will tell the story, and tell it right?

Prior to the coming of the automobile, the men who employed the then prevailing types of vehicles were limited to those who were compelled to use them, due to the fact that a horse must be fed whether he is used or not, and so it may be said, those who might have seen an advantage in intermittent service enjoyed no such privilege, since it is too plain to be denied that a horse, if he is used one day in the week, will eat his head off during the other six days, and the profit to be derived from an enterprise such as this is beyond the reckoning of man. It is believed that the average citizen, when he talks about the future of the automobile, overlooks the fact that thousands of citizens are in a position to reap a profit from the use of any form of transportation, if the equipment employed is of such a character that it may be stored and ignored, excepting on the occasion when it can be put to an active utility purpose.

It is not believed that the automobile business up to the present time has received more than nominal support from the men who employ animal transportation. The demand has been so strong, coming from entirely new sources, that there never has been enough cars to go around, and the time has yet to come when the selling of an automobile, if it is a good one, will by a strenuous undertaking. Last year, when, for some reason, financial institutions were sitting on their purse strings, some of the builders of automobiles made so bold as to proclaim that automobile selling would have to be placed in the hands of book agents and piano salesmen, that it would be necessary to camp in the front yard of the prospective and waylay him when homeward bound for a sufficient length of time to accomplish the intended purpose. But they were wrong. No such condition has ever been threatened. It will be a long time to come ere piano salesmen will have to be called upon to exert their wiles and hypnotize citizens into the purchase of cars for which they cannot find a use.

There is ample ground for the contention that piano salesmen are essential to the welfare of the piano business; there are untold thousands of otherwise intelligent women in the United States who have invested good money in pianos that they cannot play. It must be remembered, however, that these women can ride in automobiles, and it is fortunate for everyone that it is a far more healthful enterprise to ride in an automobile than it is to pay for a piano that can only be an adornment, when the purpose for which it was made is kept properly in the foreground. It is even possible to fairly contend that a piano is the source of great embarrassment to the owner who cannot wring from it the music it is said to contain, but there is no such drawback to an automobile—the fair participant in an automobiling enterprise loses neither caste nor grace in the occupancy of a seat in a well-built car, which can readily be purchased at the price which is ordinarily paid for a piano that lays no claim to a pedigree.

Art and the Body

M. C. Hillick Discusses Points on "Finish" Picked Up at the Automobile Shows

THREE classes of people interested in the horseless carriage are finding the automobile shows instructive along many lines, including painting and finishing. These classes are painters, owners and prospective owners. The painters are learning what the automobile owner is likely to want in the matter of colors, striping and varnishing, while the other two classes are getting "a line on" what specifications they should tender the painter when the car is repaired or painted.

The late New York shows were rich in painting and striping suggestions. They taught all concerned that a great profusion of colors is far from desirable on the automobile. Also that striping effects are admirable only when artistically displayed and discreetly selected; that varnish upon the car is not only for protective purposes, but for the enrichment or the illumination of the field of color and the decorations.

Apparently, and very wisely it seems to the writer, the manufacturers are getting quite away from the flashy and freakish colors, and combinations of colors, characteristic of a considerable part of their work as exhibited at the earlier automobile shows. Quieter and more modest colors are in evidence.

The dark fine blues, and greens, the grays, and browns, the ivory white, and the canary yellow (the latter being only occasionally in evidence) are the main featured colors.

The striping and decorative effects are applied in the form chiefly of simple, straight lines running all the way from a fine line to a 3-8-inch line. The "cut up" or "gingerbread" style of striping has disappeared almost entirely from the automobile.

While all this getting back to the simpler and, if you will, primitive fashion of painting and decorating the car has been in motion the varnishers and finishers have not been idle. They have attempted—and, as a matter of fact, admirably succeeded—to supply the deficiency in decorative effects and color fields of sumptuous finery, by building up a varnish foundation and crowning it with a thorough and magnificent finish.

The teaching of all this as it must be taken home by the painters, automobile users and owners is, in a sentence, that while moderately conservative colors—that is to say, colors void of "loud" and sensational effects—with striping and decorative effects to match, are to be increasingly popular in automobile "society," the varnish, the finish, and, incidentally, the last thing on the car should be—indeed, must be—the best that the most "cunning artificer" can possibly supply and apply.

Energy, Power, and Efficiency

DISCUSSING THE RELATIONS OF THESE PHENOMENA AS THEY HAVE BEARING UPON RESULTS REALIZED

STANDING upon the threshold of the "reign of mechanics," the human race, even the more enlightened part, is still so lacking in knowledge that it is incapable of broadly framing a definition of its most valuable property. We are taught at school that man is the possessor of five senses—that he can "see" objects, "hear" sounds, "smell" odors, "taste" matter, and "feel" objects, all to the edification of the intellect. Our understanding of the value of an object is founded upon our intellectual irritations as the object affects the one or the other of our (admitted) five senses. According to this hypothesis, gold, in the form of a ring, for a lady's finger, would be valuable in proportion as it appeases the sense of seeing. But when the subject is more completely analyzed it is rendered at once apparent that the value of the ring is not ascertained in this way at all. This value is more or less dependent upon the point of view as it is appreciated by the mind's eye, rather than by the sense of "seeing."

If the lady is beautiful, lovable, and responsive, the ring, as it is taken as an illustration here, will have great value in the mind's eye of the donor, and that the appreciative object (the wearer of the ring) will hold the "band" in high esteem, is more than likely. Who can say that it may not be priceless in her estimation? Who will maintain that the sense of "seeing" would suffice in its definition to adequately fix upon the value of the adornment, and yet, intrinsically, this value has not been touched upon at all so far. What sense is it that defines the intrinsic worth of the ring in question? But upon second thought, how can any sense of which man is the possessor, be the means of determining the intrinsic value of the ring of the illustration, or of any commodity based upon such flimsy viewpoints? Value is a property that must be attached to a tangible asset. Is a ring a more tangible asset if it is placed upon the finger of a lady than when in a show window? No! Then the placing of the ring upon the finger of the lady changes its aspect with respect to the lady and the donor, but not intrinsically—it is sentimental value that the adornment partakes of when it is resting upon the finger of the fair one. If it may be taken for granted that sentimental value is not intrinsic value, in other words that a ring of a given size and shape will sell from the wearer's finger for not more than it will if it is lifted out of a show-case in a store, that is as much as to say that position (place of keeping the ring) neither adds to nor subtracts from its value. But if the ring is just as valuable in a store as it is on the lady's finger, is it any less valuable as it rests in Nature (in a mine)? Why not? It is the same ring. But hold on; only the material is available in the mine; it is fashioned by man after it is mined and refined!

It Is Energy That Is Valuable!

Judgment, rather than some one of the five senses, would come to the rescue; it would whisper—and the plaint, if such it might be called would be favorable to the contention—that gold, resting in Nature, is of no value intrinsically. The element, lying dormant, has only a potential value. Leaving the explanation of potential value for a later effort, it remains to observe that intrinsic value is a property that is imparted to the gold by the artisans who mine the material and fashion the ring.

In this connection, it must not be forgotten that a large part of the intrinsic value of the gold rests in work done on the material as it is mined and smelted, leaving but a small part intrinsically, to be imparted by work in the forming of the ring. The explanation of this is relatively simple; it is necessary to put far more energy into the getting of the material than it is in the mere contriving of the adornment.

The reason why gold is so valuable may be due to the vast amount of effort that is required to procure it. As a comparison, let it be said that in the mining of a ton of coal there is no more of a task than when 1-3 of an ounce of gold is mined and made ready for use. The value of the coal is fixed (a) depending upon the energy that is injected into the mining of it, and (b) by the use to which the coal may be put. The value of the gold is fixed (a) by the work that has to be done in the mining and refining process, and (b) depending upon the use to which the material may be called.

Since both gold and coal are valued for their capabilities in the arts, it is self-evident that they have an equivalent value, and granting that a ton of coal is worth, say, $5, it is equal to agreeing that it is the equivalent of a $5 gold piece. There is a point to be kept in the mind's eye during the further discussion of these premises; the gold is valuable because it is the storehouse of such a large measure of energy per unit of mass that its "specific energy" (coined for the occasion) is relatively high. The specific energy of coal (in the same sense) is relatively low, and it would sink to a nominal level were it not for the fact that coal possesses energy. In other words coal imparts energy when it is burned, otherwise it would have a "specific energy" value on a par with the character of mineral that is not good for building material or for any other utility purpose of moment.

The mind must now be prepared to accept a sub-division in the method of reasoning, in the further explanation of the phenomena of energy. Coal has energy stored in it; gold has none. Coal, then, is valuable on account of the energy it possesses, and, as energy is expended in the mining process. the value of the coal is reduced somewhat. Gold, not being an energy-giver, is valuable in proporition to the energy that can be imparted to it or expended on it per unit of mass. It is a strange thing to say that gold would be of no value at all were it not for the fact that it is so concealed in Nature that $20.00 worth of energy must be expended in the acquiring of an ounce of the metal; it is just this energy that is valuable—not the element *per se*. The gold is a mere convenience in this case, and, as will be appreciated, were this metal lying around upon the surface of the earth, its value would fall to the value of cobblestone or other useless material.

World Holds Fixed Supply of Energy

Energy, in the abstract, is a fixed quantity in the universe. Energy, *per se*, is a potential force that is of no intrinsic worth so long as it lies dormant in Nature. The value of coal in a mine is no greater than when undiscovered only to the extent that it is handy to know where to go for it, if, perchance, some of it is desired for a specific purpose. Energy, as it resides in coal in the mine, is just as prevalent as the energy in the coal that is mined and resting in front of a boiler ready to be burned. But, as stated, the energy of the coal in the mine is of no intrinsic value, whereas the energy that resides in the coal as it lies in front of the boiler is worth something; now, what is

the difference? It is the same form of energy in either case! Is it not represented by the mere difference between the coal that has been rendered intrinsically valuable by work done upon it, and the fuel that lies dormant in Nature's storehouse, upon which there has been no work done?

Work Is the Key to Intrinsic Value

Gold in Nature's storehouse is worth nothing; put work into it and it is the pride of the maiden who adorns her finger with the ring made of it! Coal, in the bowels of the earth, however crammed it is with energy, is of no more value than the energy that resides in the sun until work is done in the mining process—it is the work done that constitutes the value intrinsically!

But the fear is ever present that all the men who have failed to appreciate the distinction between energy and work will find it difficult to grasp the subject no matter how much it is explained; take the statement that "coal, in the bowels of the earth, however crammed with energy, is of no more value than the energy that resides in the sun, until work is done in the mining of it!" It might be said, what is the value of the energy that resides in the sun? How can this energy be utilized? What is the use of referring to it? It is 92,000,000 miles away! But on second thought, remembering that all the energy of which man has access to came from the sun, or from suns of our universe; the energy in the coal that we mine; the energy that we put into the gold that is made to adorn the lady's finger; the energy that introduces what we call "intrinsic value" into everything that we make more valuable than it is in Nature—when a thing is elevated from a dormant to a potential state—came, or comes from the main source of energy—the sun.

Energy is dormant in coal as the latter lies in the ground, but energy is potential in a brick as it rests on a wall 10 feet from the ground. Why is it that the brick on the wall possesses an advantage over the coal in the ground? Why not? Work was done in elevating the brick to its place on the wall, but no work was expended by man in the lifting of the coal out of its bed in the bowels of the earth. Before departing from the subject of the energy of the sun, let it be understood that all the energy that is now residing in the sun is potential, but all of the energy that departed from the sun in the past, as it is locked up in coal, wood, or what-not, is dormant, excepting that measure of energy that rests in the form of snow on eminences, ready to melt under the persuasive argument of more of the sun's heat on Summer days, when, if the water formed therefrom is entrapped and put to use, the energy, being in a state of potentiality, will perform useful work. In the same way, if the heat from the rays of the sun is caught in a trap and this energy is put to work, chemically, electrically, or in the boiling of water (thus rendering the energy available in steam), it retains its potential state, and work may be done.

Efficiency Is a Property Connected with Work

It was only the other day that Col. Charles Clifton, in an address delivered to a body of eminent automobile makers, said: "Study efficiency—take efficiency home with you * * *." What is efficiency? Has it anything to do with energy? Is it more a property of work? Let us see! The coal that awaits work to render it available for power purposes, keeps its energy for ages; there is no loss of efficiency; it will be just as efficient 2,000 years from now as it is to-day; as it was before the Romans subdued the Carthagenians, and before that day. Efficiency, then, does not seem to be a property that materially alters energy in a state of repose.

When work is done, energy is expended, and if all the energy expended goes to useful work, the efficiency of performance will be 100 per cent.

But in doing work, if some of it is expended to no purpose, to whatever extent this part relates to the whole, the efficiency will be reduced.

The coal that we use for heating water, to turn it into steam for power purposes, may be so inefficiently mined that its value for power purposes will fall below the zero of our present standard. All along the line, as work is done on the coal, its value is detracted from in proportion as inefficiency reigns, and what is true of the coal is equally true of every other form of work that is done by man, or at his behest.

Work Is Measured in Two Ways

The principle of the conservation of energy should be well understood. If energy is converted from one to some other of its forms, work must be done upon it. Were it possible to convert all of the energy that resides in a pound of coal into electrical energy, for illustration, the conversion would be on a basis of 100 per cent. But this is not possible by any process that we now know of. No matter how the operation is performed by which energy is transformed from one to another of its states there is a loss of the energy, but it may not be all in one form. The efficiency of the transformation must be looked into in the gathering of information relative to the redistribution of the energy. Since some of the energy will reside in one form and the balance will be scattered, the effort (work) will be distributed according to the efficiency, and it is this question of efficiency that attracts the greatest measure of attention on the part of those who struggle with the various problems of work. What is the conclusion to reach? May it not be said that work is done when energy is expended? But may it not be concluded that some of the work is futile? The part of the work that may be turned to good account represents "intrinsic worth," and the remaining portion is the measure of inefficiency. Since it is inevitable that some of the work done will be due to loss of efficiency, is it true that inefficiency is detrimental? Not necessarily! Gold is valuable on account of the vast amount of work that has to be done in the accumulation of it! Inefficiency is only a detriment when it depicts a loss.

Values Are Purely Relative

Nature is the embodiment of law! Man struggles with the problem of living in his bungling sort of way, violating Nature's Laws, frequently to his great disadvantage, but rarely more than "the state of the art," so-called, foretells. It is when some individual less skilled than his neighbor falls below the standard of his time that he is made to see the error of his way.

Civilization is a condition; as we advance in civilization we harbor necessities. It is because civilization is receiving an impetus just now, due to the use of the automobile, that it is more necessary to discuss well-authenticated principles, laying them bare before the eyes of those men who have not kept abreast of the times, in order that they will understand that in the relative situation there is danger for them; they must catch up!

How to inculcate principles into the understanding of those who suffer by comparison is the great problem of the time. Success of the individual is not what is desired by the community. It is the general success of the community as a whole that must be looked after, and, taking energy as a basis, with work as the remaining factor, efficiency must be courted by all on the plane of equality, Nature supplies all there is of energy; enlightenment is the foundation for efficiency, and industry accomplishes all that remains.

Money Burns a Hole in the Pocket—The man who goes down the road in the character of automobile that does not suit him is the fellow who should have his pocket made of asbestos so that his money would keep long enough to allow his judgment to catch up.

A Brace of Engineering Views

SPACE PREVENTS THE RUNNING OF A NUMBER OF ENGINEERING EDITORIALS THAT HIT AT THE HEART OF THE SUBJECT, LEAVING ROOM FOR THESE

IT is not believed that it is possible to say that there is a crying need for anything before the demand becomes so great that it must be placed upon automobiles in order to be able to sell them. This is not a doctrine that should be worked to the limit, but it is a reason why it is not desirable to employ innovations ahead of their time.

Keep Improvements Away from Used Motors

THERE are very few men who would go to the pains of putting a new marble top extension on an old wooden building; they would fully understand that the foundation would be a little shaky if such an undertaking was consummated, but what is the difference in principle, and, let it be said, in the result, if an old motor is provided with a new two-spark ignition system? There is a great difference between the explosion pressure in the cylinders of a motor if the gas is ignited at two points remote from each other and the expansion pressure when only one spark is used. As a rule, in the average used motor the explosion, or, better yet, expansion pressure, is not over 200 pounds per square inch, but if two sparks are used in place of the old system it is more than likely that the explosion pressure will run up to perhaps 300 pounds per square inch.

Will an old motor put up with this kind of treatment? Take a motor, for illustration, that was originally designed on a basis of an expansion pressure of 200 pounds per square inch, will it sustain if the pressure is boosted up to 300 pounds per square inch? Supposing that the cylinders will be able to stand the extra duty thus imposed, what then? Will the bearings hold out?

But even if there are quite a number of motors that are so well made that such additional work can be imposed upon them after they have done service for a year or two, what is the percentage of all the motors that are now in service that will fail to conform to the new requirement? Can the automobiling public afford to be set upon to the extent of having a large amount of its property destroyed? Will it not be more to the point to put up with the good service that the old motor is capable of rendering even if the ignition service is not "the very latest thing"? What is the good of having the most recent innovation if it gets in the way of success?

Of course, there will be quite a number of men who will claim, and some of them rightfully, that their motors will not be overworked even if the explosion pressure is increased 50 per cent. Let them make their claims; the fact remains that it is a good enough idea to let well enough alone—put the newer ignition system upon the motors that will be capable of doing the extra work.—J. W. C.

The Self-Starter: Why Is It Not Extended?

In looking over the exhibits at the Madison Square Garden Automobile Show, only two self-starters were discovered in actual service on cars. That there is a definite demand will be illustrated by quoting a wealthy newspaper proprietor, the owner of many automobiles, who stated that he would not buy a new car that was not equipped with a self-starting device.

And how many men really enjoy cranking an automobile, and how many ladies have the strength to do it? The advent of the twentieth century has made it quite out of fashion for man himself to do mechanical work, for he has found that machinery can relieve him of this and do better work in less time. No man, mechanic or otherwise, will dispute the statement that the high-class present-day automobile is a wonderful machine. It does its principal work remarkably well, but without a strong arm is absolutely helpless in getting started. But if the automobile engine was always easily started the story would even then be somewhat different, but with gasoline claiming closer relationship to kerosene every year, it becomes, on a cold night in the Winter, a matter of tremendous physical exertion to start a car. Then, too, the chances of getting rapidly chilled after the car has been gotten in motion are very great, and no man who thinks at all of his own health should willingly run such a risk.

Up to within the last year manufacturers could truthfully say that they were so busy with the perfecting of the essential parts of the automobile that they had no time to spend on anything that was not absolutely necessary. This year's show, however, presents so few alterations in the cars of established name that the makers can no longer claim a press of work in their engineering departments. Reward in the business world usually comes to the man who anticipates a demand. It is true of most big concerns that they suffer from an inertia which certainly does not assist them in progressing. Self-contentment is another of the insidious affections to which the large and relatively successful companies fall rather easy prey.

One will frequently hear the statement made that automobiles should be kept as simple as possible. This statement is so nearly true that it usually convinces. It would be much nearer the truth to say that the automobile should provide the user with every comfort and convenience with the most simple design possible. There are two classes of "extra parts" on automobiles, those due to poor design, which, of course, are entirely without justification, and those due to an attempt to increase convenience and luxury, which justify themselves. There is probably no one to-day who would attempt to argue that the hot and cold running water and the electric lighting found on the Pullman sleeper do not, in convenience and comfort, justify the extra complications of construction. Yet the "smart" automobile still requires manual labor to start its engine. It is safe to assert that this condition of things will change before so very long. At the exhibition of imported automobiles one maker supplied, on demand, an electrical self-starter on the smaller models, and a self-starter using compressed air on the large ones. There is no particular experiment in providing something of this character, for self-starters have been operating on some cars for the past two or three years.

The complication involved in making a motor so that it can be started by pressing a button is not great. The system involves the use of a power air pump or a valve to take high pressure gases from the cylinders, a tank and a distributing valve with pipes to each cylinder. If a power air pump is used it serves to inflate tires as well as to start the engine.

The self-starter would make it possible for women to drive cars that are now exclusively used by men, since the physical exertion of "cranking" is too great at present.

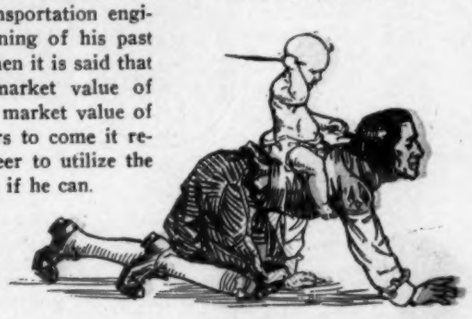
It would certainly seem that with the demand here, and with appreciation a certainty, the self-starter should be at least an option on every high-grade motor car.—HENRY G. MCCOMB.

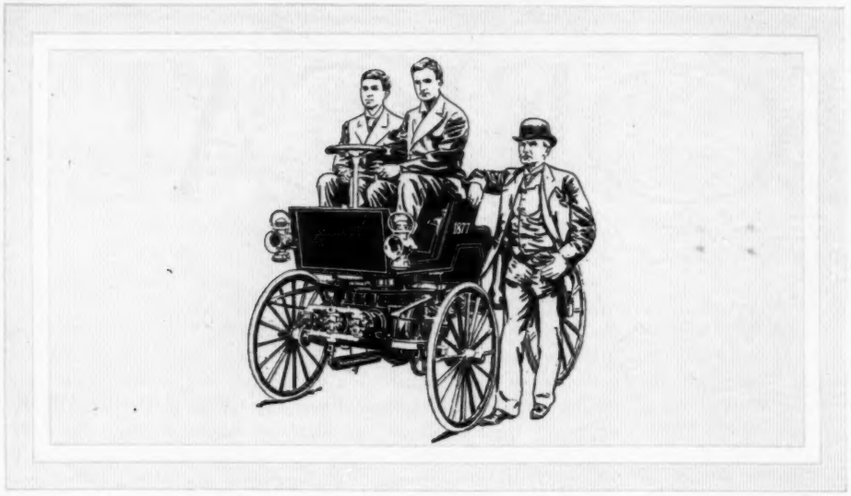
HISTORICAL

ACTIVE effort in the building of automobiles dates back to the first attempt on the part of pioneer transportation engineers to contrive self-propelled vehicles of the class that are capable of making progress over the give and take of the roads in the absence of a permanent way as steel rails on a roadbed. It is in keeping with the progress that transportation engineers have made to call attention to the devices that have survived the vicissitudes of time, letting those who have time to record futile efforts and dead languages maintain a permanent record of them. Steam engineering had a good start over the more direct methods of utilizing energy as embodied in internal combustion motors, but the leader in a contest is the more likely to fall by the wayside, if for no other reason, due to his earlier opportunity to wear out and become obsolete. In the onward march of transportation methods the fates have ordained against the survival of steam in this latest and most approved method of transporting passengers and freight, and the internal combustion motor, with all its inherent incongruities, because of its nearer approach to perfection from the thermal efficiency point of view, has had its range of usefulness extended, and it stands to-day on the platform of success, vying with electricity as its companion in the emancipation of the horse.

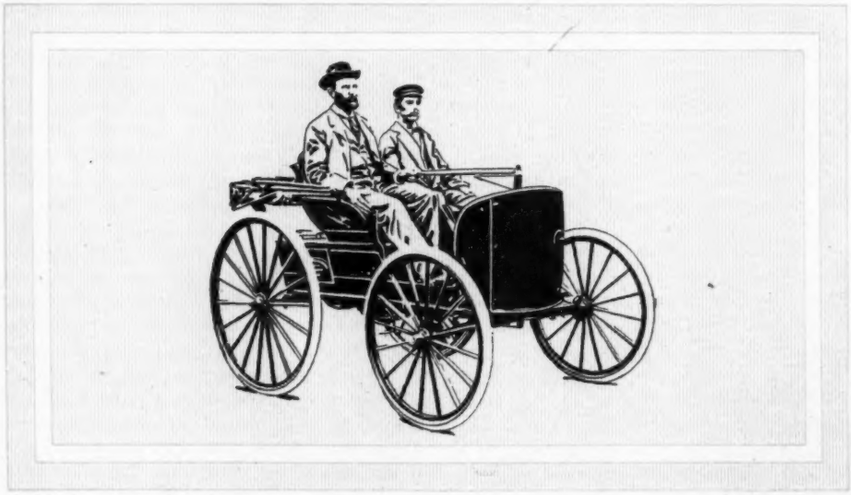
The history of the success of the automobile cannot be written without including the worthy efforts along electric lines, and the things that have survived embodying improvements in internal combustion motor work. Were time to be taken in the discussion of the future prospects for success of transportation engineers, the man who would have the temerity to favor either of these methods as being the most likely to beat the other in the race would fall from his pedestal and land upon the floor of the speculator. There are those who dream of the time when energy will be abstracted direct from coal, and, in view of the splendid progress that has been made along lines that were once regarded as impossible, it would be unwise to deprecate the idea of obtaining a higher thermal efficiency from motors than that which is possible by any present working method. The very fact that the internal combustion motor has survived and forged ahead, if the progress made was due to the high thermal efficiency of the principle employed, it is within the probabilities that this supremacy can only be threatened by a principle which has within its makeup greater possibilities in a thermal way.

The future looks most promising to the transportation engineer whose storehouse of enthusiasm is inexhaustible; he can well afford to be satisfied with his past performances, due to the fact that he has progressed and fought inefficiency from the remotest past to the time when it may be claimed that 28 per cent. of a total of 38 per cent., from a thermal point of view, involving the internal combustion motor, is turned into useful work. That the transportation engineer is at the beginning of his past may be concluded when it is said that liquid fuel has a market value of over eight times the market value of coal, and in the years to come it remains for the engineer to utilize the energy of coal direct if he can. Along this line will be witnessed some of the developments of the future.

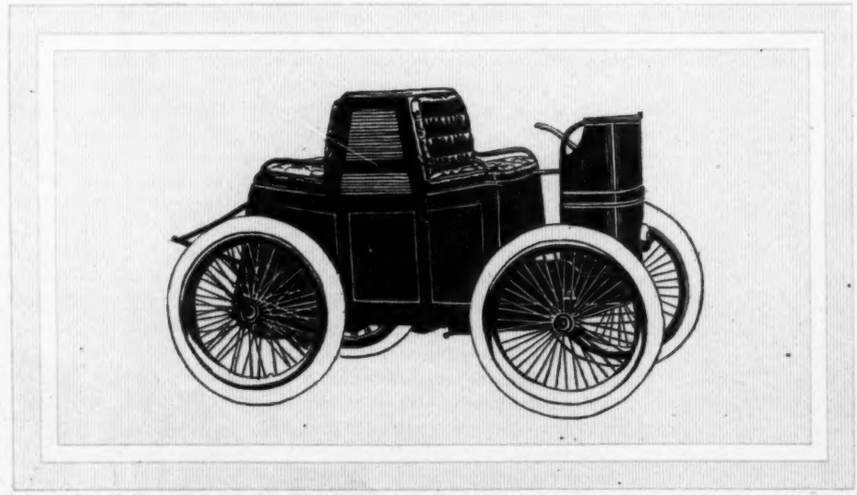




1877—George B. Selden's Model Automobile and the Basic of the Selden Patent Which Was a Bone of Contention for Some Time.



1895—Charles E. Duryea in His Rig as It Appeared in the First Road Race at Chicago, Which Was Promoted by H. H. Kohlsaat



1897—Alexander Winton's Model Which Was on the Road in This Year and Formed the Basis of the Activities of the Winton Company

The History of the Internal Combustion Motor

The interval of time which elapsed between the coming into the world of the horse and the time when he was enslaved as a makeshift in transportation work was the interval during which it took men to find out that the horse was a better instrument for the purpose than the slave whom the horse supplanted. In the same way, the interval of time that elapsed between the date of invention of the internal combustion motor and its application to vehicles for transportation purposes represented the period of awakening of mankind to the fact that it was worthy of serious consideration for the purpose, and that the horse stood in the same light with respect to future progress as that of the slave before him. When George B. Selden was awarded letters patent on November 5, 1895, he found for his use the scattered components of the modern automobile in the shape of the Brayton internal combustion motor, which was patented on April 2, 1872, to be followed by other patents, one of which went to issue June 2, 1874, but after events proved that the Otto invention, which reached a more or less complete state of perfection in 1876, had the inherent merit to survive the criticisms of experience, and it stands to-day as the underlying principle of all internal combustion motors of the four-stroke cycle type used in automobile work.

The history of the modern automobile, in view of what has been said, has for its foundation the four-wheeled vehicle of the Phrygians which came into vogue before Rome was founded, equipped with the Otto cycle motor, as it was brought out by Doctor Otto in 1876, although the work of Otto on internal combustion motors dated back to 1854 for the beginning, and he attained encouraging success which came to public notice in 1866.

Technical Differences Between Brayton and Otto

When Brayton brought out his motor in 1872 it comprised a working cylinder and a pump. In the pump, gas from a main was compressed and stored in a reservoir whence it passed to the working cylinders, at the entrance of which was a lighted torch for the purpose of igniting the gas, particle by particle, so that it entered the cylinder in the flaming state. Dugald Clerk in relation to the Brayton flame engine described it as of the constant pressure type, whereas the Otto cycle motor was described as the constant volume type. It is the constant volume type of internal combustion motor that is being used in automobile work, and according to Clerk the Brayton principle was set forth by Doctor Joule in 1844, whereas the con-

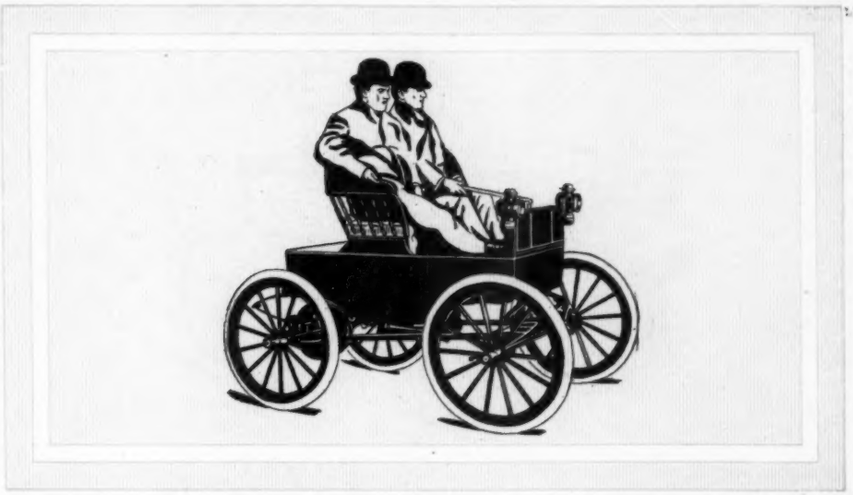
stant volume type of motor had its inception in the work of Otto, who placed it upon the market when it was known as the "Otto silent engine," in 1876.

Automobile Inventors Made a Combination

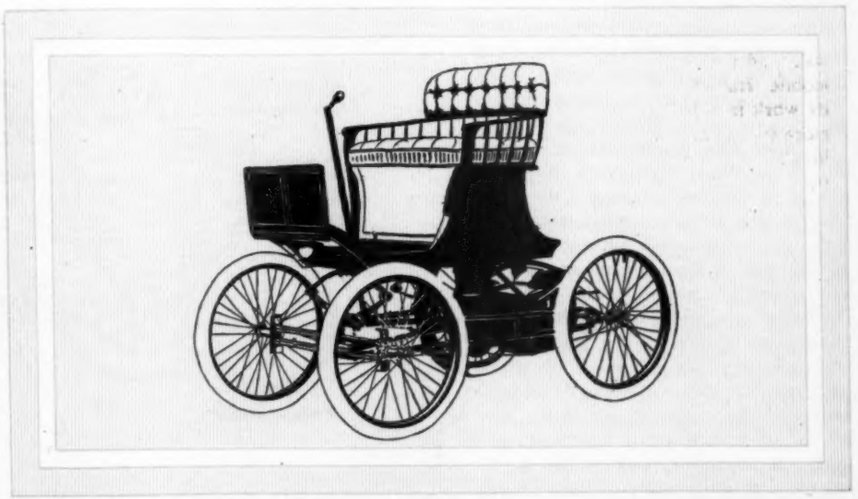
In view of the early use of the four-wheeled vehicle as drawn by horses and other animals from the time before the Romans, and the later invention of the constant volume type of automobile motors, it remained for automobile engineers to combine these well-known elements and harmonize the relation so that the vehicle could be propelled over ordinary roads, utilizing no more skill than is afforded by a layman, accomplishing the purpose with safety to the public, and on a commercial basis for the users of the cars so made. It was in relation to the combining of the elements that compose commercial automobiles of the gasoline type that the controversy which arose was recently settled by the decision of the United States Circuit Court of Appeals, Second District, before Lacombe, Ward and Noyes, Circuit Judges, and in the rendering of this decision the opinion of the Court was founded on the contention that the Selden patent combines the use of a vehicle and the type of motor as originally brought out by Brayton, so that those who employ the type of motor as originally brought out by Doctor Otto in combination with a vehicle are utilizing elements upon which there is no patent, and so it may be said that the modern automobile, which lays claim to a position of the greatest eminence in the arts, came into the world through a distinct demand for its use hailing from universal quarters, unheralded by letters patent as the joint work of a coterie of eminent transportation engineers, thus depriving any one man of the right to claim as his invention the device which is destined to be the leveler of class distinction, and the means by which the farmer shall live in the city and the merchant shall live on the farm, to whatever extent fancy dictates without the shadow of interference with the success of their individual callings.

The Automobile Is Evolutionary in Its Trend

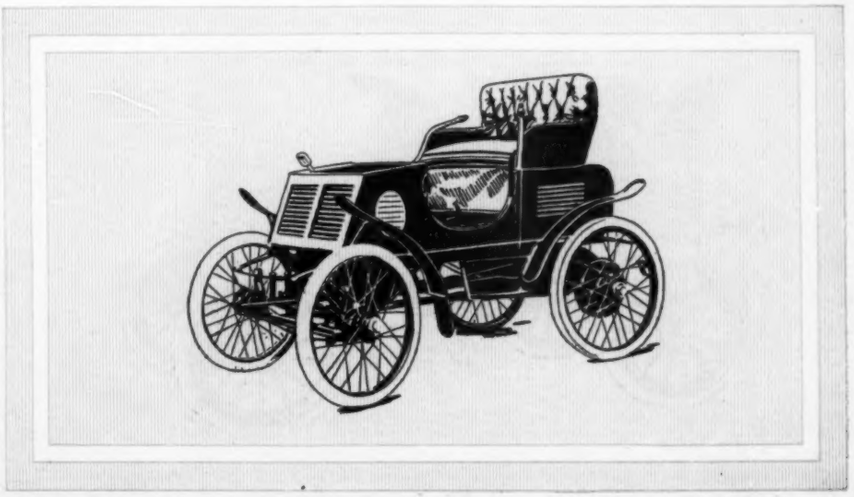
Since the world has been deprived of the honor of paying fitting tribute to some one man for the sudden and unexpected bringing out of the plan of the automobile on an inventive basis, it still remains to observe that instead of one invention there have been thousands of inventions, and, while it cannot be claimed that success lies in the maw of some one of these ideas, it can be stated that the harmonizing of them in their relations to each other was a mighty



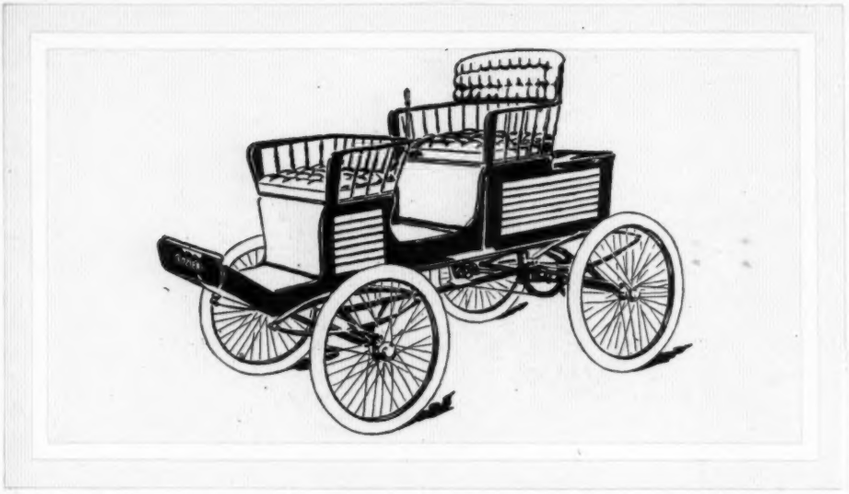
1888—Baker Electric Vehicle Which Was the First Car to Employ a Few Cells of Battery and a Single Electric Motor Suspended Under the Body



1889—Loomis Car Representing an Early Attempt to Place the Power Plant and Transmission on the Live Rear Axle



1900—Thomas B. Jeffery Brought Out the Rambler Automobile, Making a Hit at the Time Owing to the Neat Form and Good Performance of the Car



1901—How the First Lozier Automobile Looked as It Appeared in The Automobile That Year

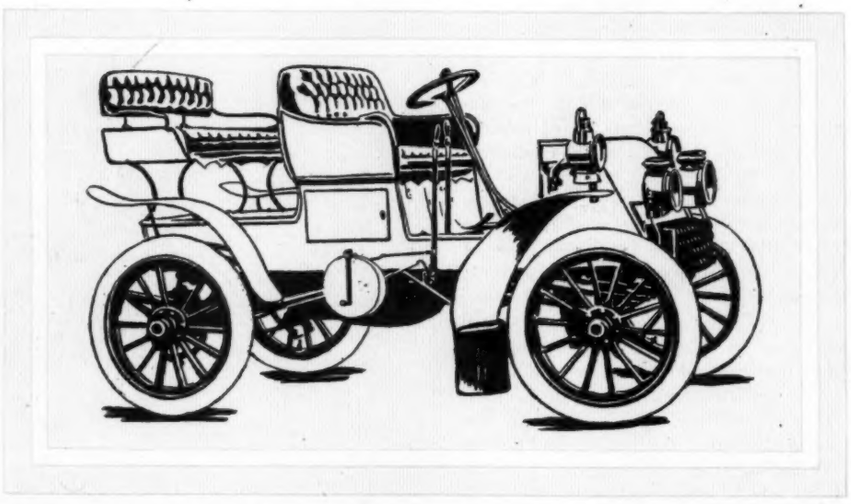
task, and it is to the credit of the automobile fraternity that it accomplished its work in a trifle over a decade, doing more in that time than was accomplished in all the years before, dating back to the dawn of written history.

In order to illustrate the rapidity of the strides that were made since the coming of the gasoline automobile, illustrations are here given of some one make of car for each succeeding year, leaving out, of course, current product, since it will be shown at the Coliseum in the greatest profusion. If these illustrations are examined and studied critically they will not only depict the trend of events but they will serve as an indication of the extent to which the men of ten or twelve years ago were tied down to precedent, making the horse-drawn vehicle the guide of their efforts, refusing utterly to see anything besides. A comparison of the automobiles with an interval of ten years constitutes a frank avowal of the fact that the world does move, and that the men who accomplish the most are those who look ahead, displaying hopefulness and a little daring with their bravery, thus blazing the way for quantity production.

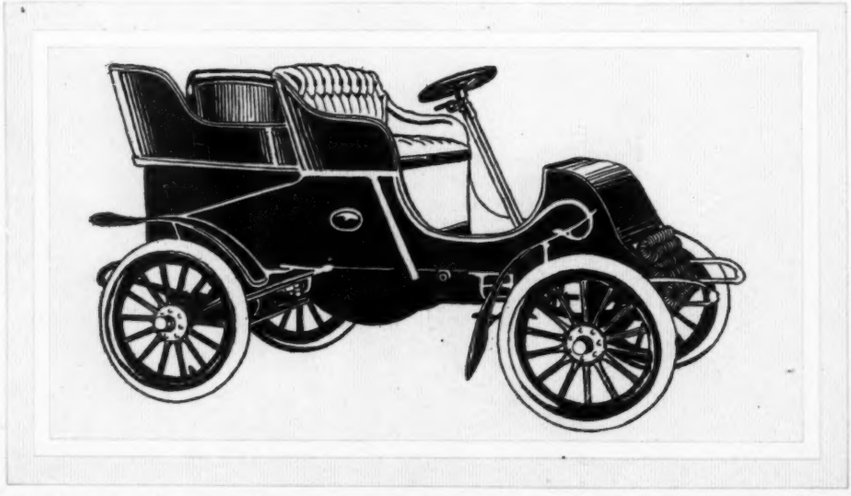
How the Automobiles Were Improved from Year to Year

As the story was told in THE AUTOMOBILE, beginning with 1902, a few of the main characteristics may be set down as follows:

1902 (May 30).—An eye witness of the A. C. A. endurance and speed trial, which took place on Memorial Day under the auspices of the A. C. A., would have seen an aggregation of cars, including 1 electric and 14 steamers, mingled with 39 gasoline automobiles, and the highest powered gasoline cars were equipped with 16 horsepower motors in chassis that were not far remote from horse-drawn vehicles at that time, with coil radiators sticking out in front and in quite a number of cases swung below the chassis frame, and all the other indications of the carriage-maker's art. The rear entrance tonneau was just coming into vogue, but it had few exponents among the American builders of automobiles.



1902—This Was the Packard Automobile as It Appeared Showing a Marked Attempt to Manufacture a Modern Automobile



1903—The Cadillac Rear-Entrance Tonneau Which Was Then Being Exploited Abroad and Taken Up by the Cadillac Company Concurrently

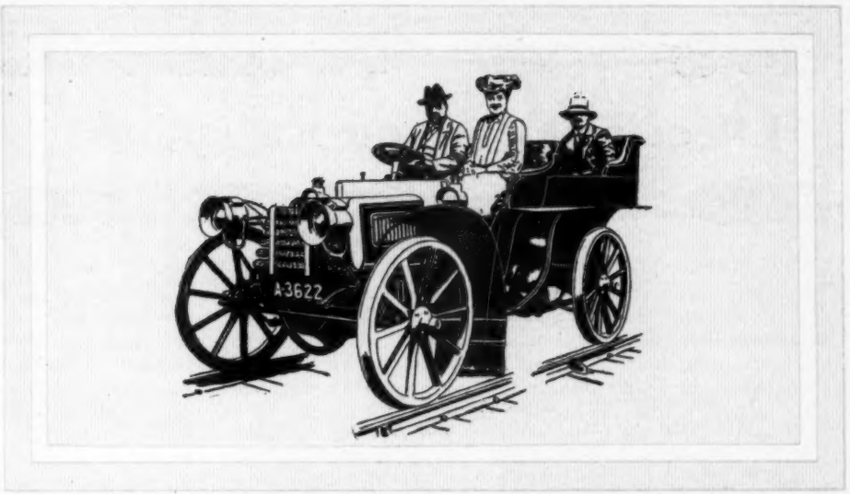
1903 (Jan. 3).—As it was reported in THE AUTOMOBILE, the motorists of Chicago were up in arms over the proposed city ordinance, the purport of which was to compel every automobilist to carry the official number of his car on the face of each lamp and also a number with eight-inch figures on the rear of his machine. The city fathers in Chicago were undoubtedly in favor of advertising, but the automobilists were too modest to take advantage of this excellent opportunity, and, strange to relate, they failed to present the strongest argument possible against being tagged, since other

records of the year seemed to show quite conclusively that the cars made were of low power and in many ways so inharmonious that it was a question of whether or not they would go very far at all, but the bursts of speed that they seemed to be capable of were nevertheless appalling to the city fathers of Chicago at that time.

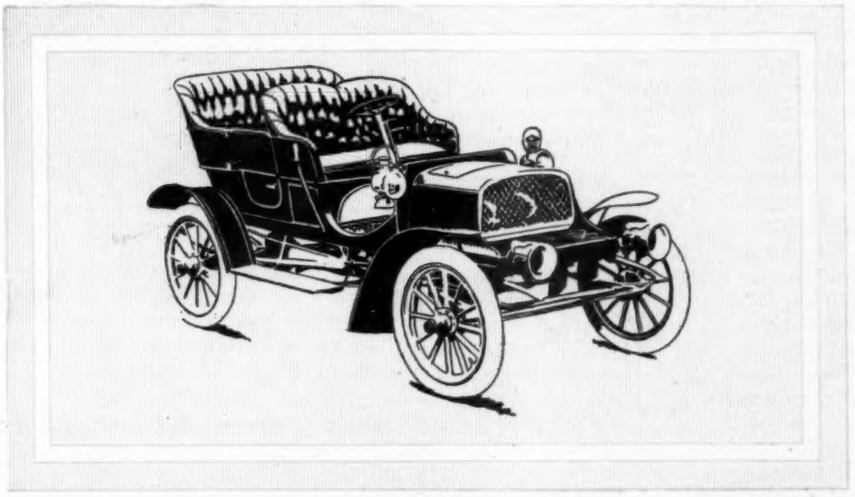
1904 (Jan. 2).—On page 10 of THE AUTOMOBILE the front end of the Howard motor was illustrated, showing the half-time gears of large and massive construction, not enclosed, but instead an integral guard was cast on the motor case, and it passed up and followed the contour of the gears part of the way around, thus indicating that it was the idea of the designer to protect automobilists from the teeth of the gears. This practice was quite general at that time, and the indications are that it did not occur to designers in 1904 to protect automobilists' ears from the noise that gears make. On page 33 of the January 9 issue of THE AUTOMOBILE the Thomas three-cylinder motor is shown, and on the opposite page a rear entrance tonneau of the same make indicated the state of the art at that time. On page 52 of THE AUTOMOBILE of January 16 an attempt was made to define the legal rights of automobilists, and the conclusion was reached as follows: "The word 'automobile' has as yet scarcely entered the field of legal investigation and it follows, therefore, that the rules governing the rights and liabilities of the automobile owner must be deduced from the rules laid down in the past, by which are judged the actions of owners of vehicles already in use."

1905 (Jan. 7).—Under the caption "Complication and Simplification" the editorial comment as follows summed up the then state of the art: "Among the cars worth serious consideration nearly all come under one of two broad classes—those in which the constructor had succeeded in reducing complication and carrying simplicity to the point below which losses in efficiency would occur forming one class, and not the larger one either. The other class embraces those in which the designer had incorporated all the mechanism that could well be gotten into the space encompassed by the frame and the hood with a liberal overflow under the footboard, the body and on the dash. Such cars have 'talking points' galore and now only need an 'automatic' driver to make motoring the lazy man's delight and the repairman's chief source of joy."

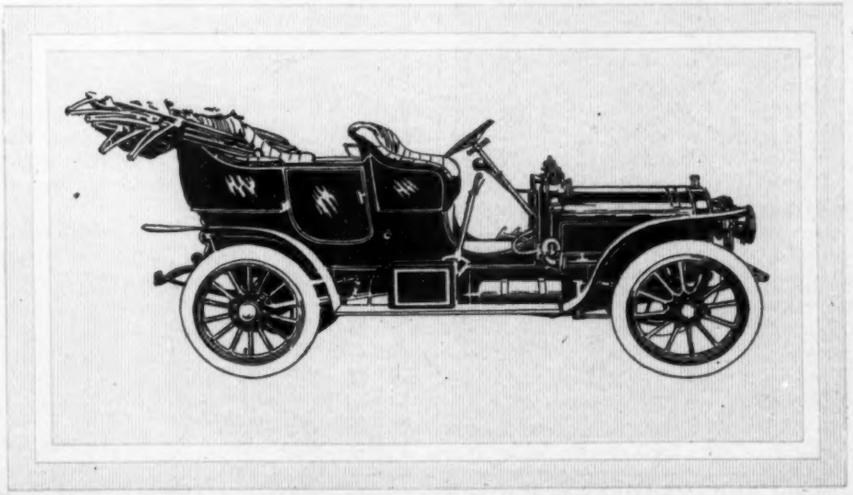
Such was life a matter of five years ago in the automobile business, but the modern automobile in crude form was represented in the cars of that year, and evolution has progressed rapidly.



1904—How Charles E. Glidden Went on an Early Tour—This was After He Had Tried Out a Mark XIX Columbia Electric Vehicle and Found It Rather Too Restricted of Radius to Do Overland Touring In



1905—The First Premier Automobile—The Motor Was Air-Cooled and Set Across the Frame to Better the Cooling Service



1907—Stoddard-Dayton Automobile With a Side-Entrance Tonneau—This Was a Great Stride in the Direction of the Modern Automobile—There Were a Number of Makes in This Advanced Class at About This Time

Effect of Color on Radiation

RECORD OF A TEST WHICH WAS MADE BY C. L. WHITE TO ASCERTAIN THE SURFACES UNDER DIFFERENT CONDITIONS OF EMISSIVITY

IT is not often that the color of the finish interferes with the efficacy of the mechanical equipment, but it is possible to get into trouble by disregarding the mechanical requirements or, better yet, the thermo-dynamic relations by overlooking them in the desire to impart a distinctive appearance to an automobile. As an illustration of a difficulty which might become serious, one in fine that has to do with the distorting of the thermic conditions to impart finish, reference may be had to the painting of the radiator, involving the use of aluminum paint on the one hand, or lampblack on the other. In scientific circles, it is of course recognized that the amount of heat which will be given off by a surface in a unit of time depends upon the physical condition of that surface and color. It would be possible to say offhand that the black effect of lampblack would be considerably more efficient than the bright finish of aluminum paint. Since it is the function of the radiator to absorb heat from the cooling water, transferring it to the current of air that sweeps over the surfaces, it remains to observe that the radiator must have a certain thermal capacity, otherwise the water will boil away. Since it is difficult to provide a sufficiency of surface in radiators for motors of considerable power, it is important to maintain the highest possible efficiency of the functioning relations, so that the difference between the emissivity of a lampblack-coated surface and a surface coated with aluminum paint is of sufficient importance to be recognized.

For the purpose of determining the real difference in efficiency between the two surfaces involved in this discussion, a test was made under the conditions as follows: Using the same thickness copper as that employed in the making of radiator tubes, two calorimeters or cups were made. These calorimeters were 2 inches square by 3 1-2 inches high. They were arranged as shown in Fig. 1; two thermometers were suspended in them and they were placed on the triangular wooden block as shown. Boiling water was then poured into these receptacles, and simultaneous readings of temperature were taken at intervals of two minutes. Fig. 2 shows the curve plotted from the result obtained with the black and plain copper tubing, and Fig. 3 is a comparison between the black and the curve from the result of the aluminum painted tubing. An examination of Figs. 2 and 3 will show that the addition of a coat of aluminum paint was really not very great. The conditions of the test were such as to involve the use of only 0.45 pound of water. The temperature of the room was 73 degrees Fahrenheit, and 32 square inches of surface was exposed to radiation. The total time of the test was 42 minutes.

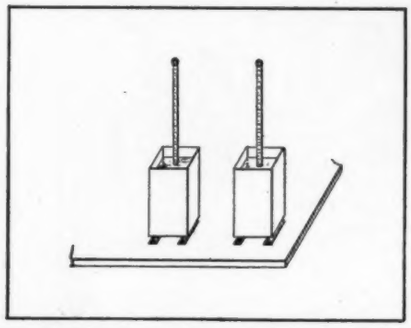


Fig. 1—Calorimeters and thermometers and method of testing temperature

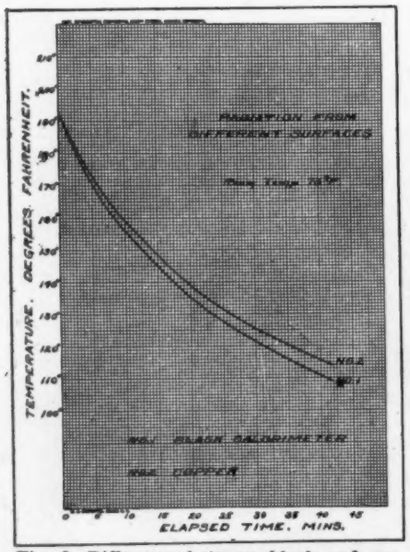


Fig. 2—Difference between black and copper tubing

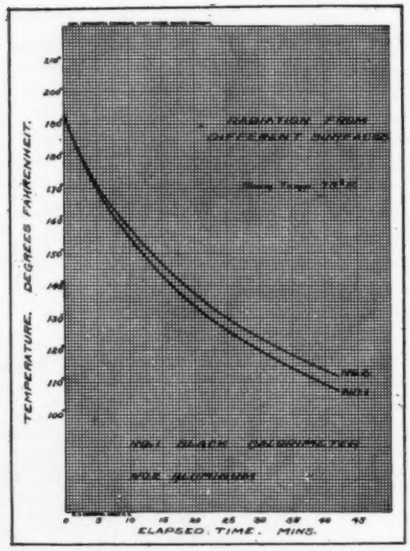


Fig. 3—Difference between black and aluminum painted tubing

Slow Tapers Advantageous

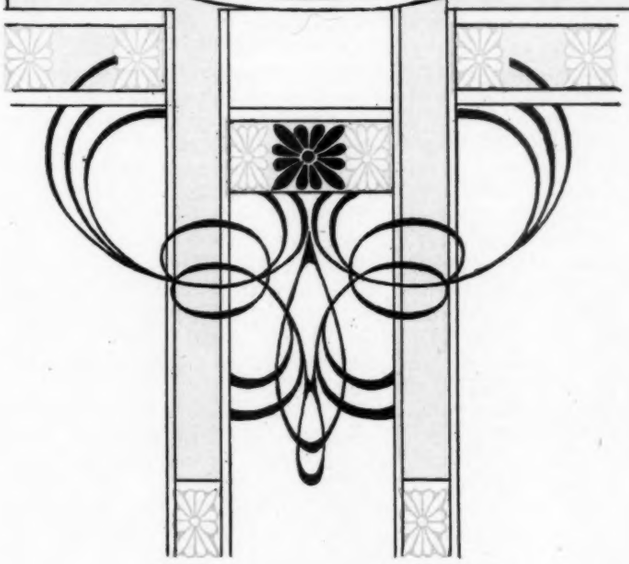
In the fitting of flywheels when a flange is not available it is good practice to turn down the end of the shaft to a slow taper, say about 3-16 of an inch to the foot. The pressure used in pressing the flywheel on the shaft, assuming that the diameter of the shaft is about 2 inches, is about 15 tons. The key will have but little to do under such circumstances. Some other taper may be selected and the tabulation here given may serve to assist the designer in making a proper selection:

TAPERS PER FOOT AND CORRESPONDING ANGLES AS GENERALLY USED MAY BE SET DOWN AS FOLLOWS:

Taper, per foot	Included Angle Feet	Angle with Center Line Feet	Remarks
1-8 inch.....	0 — 36	0 — 18	
3-16 inch.....	0 — 53	0 — 26	Press fits
1-4 inch.....	1 — 12	0 — 36	Taper pins
5-16 inch.....	1 — 30	0 — 45	Fits to be tight, but
3-8 inch.....	1 — 47	0 — 54	more readily removed
7-16 inch.....	2 — 05	1 — 02	
1-2 inch.....	2 — 23	1 — 12	
3-4 inch.....	3 — 35	1 — 47	
1 inch.....	4 — 46	2 — 23	
1 1-2 inch.....	7 — 09	3 — 35	

Using the taper 3-16 inch to 1 foot fixes a difference in diameter of 0.001 foot for each 1-16 foot of end motion in pressing the fit. Gauges marked by 1-16 inch increments are therefore of much value, since the machinist may know at sight the number of thousandths to be removed.

TECHNICAL REVIEW OF MOTORS



THOSE who are fond of making comparisons with a view to arriving at a definite conclusion as to the future of the automobile industry have found heretofore that the builders of automobiles have balked at accepting the statistical trend and they have made changes sometimes of a relatively radical character, despite the fact that the curve of events would seem to indicate that they should have gone in the opposite direction. The enclosed type of body is one of the finest illustrations of a sudden change in the ideas of designers, and it shows how fickle is public opinion. It was only a few months before the opening of the new year when the makers of automobiles, in all parts of the country, were debating as to whether or not they would build torpedo and gunboat types of bodies as a stock proposition, and quite a few of them were unable to see that the automobiling public was bent upon having enclosed types of bodies in any event. In some instances the makers of cars split their product in twain, building half of the bodies of the enclosed type with foredoors and the other half along, as they said, the well-known and accepted lines.

That there are no permanent lines in the automobile business is one of the points that has been well authenticated by the many changes that have been wrought within the last ten years, and the coming out with new models annually, despite the excellent work done by the obsolete product, is one of the strong arguments for the contention that the evolution is ever going on. But if body designs have changed from year to year, these changes are no more marked than those which have to do with machinery problems.

Referring to the mechanical equipment, it is within the memory of every automobilist when the wheelbase length was 60 inches, and it was considered a radical departure when this distance was run up to 72 inches, but the next year brought an advance to 90 inches, and after that some bold spirit built a 100-inch wheelbase car. A little experience very promptly indicated that increasing the wheelbase had a marked effect for good, and while novices debated as to the expediency of going beyond 110 inches as the absolute limit for what they termed a "road locomotive," the fact remains that to-day the automobilist of experience looks upon a wheelbase length of 150 inches with equanimity.

Power Plants Underwent Many Changes in Time

The dawn of the automobile saw the introduction of a heterogeneous mass of ideas in power plant work with a controversy having for its basis the relative virtues of the types of motors as follows:

(A) Steam power plants;
(B) Electric power plants;
(C) Constant-pressure internal-combustion motors;
(D) Constant-volume internal-combustion motors;
(E) Air-cooled internal-combustion motors;
(F) Water-cooled internal-combustion motors;
(G) Two-cycle internal-combustion motors;
(H) Four-cycle internal-combustion motors;
(I) Six-cycle internal-combustion motors;
(J) Slide-valve internal-combustion motors;
(K) Poppet-valve internal-combustion motors;
(L) Automatic inlet valve internal-combustion motors;
(M) Sleeve valve internal-combustion motors;
(N) Water-cooled internal-combustion motors with thermo-syphon circulation.
(O) Water-cooled internal-combustion motors with gear pump circulation;
(P) Water-cooled internal-combustion motors with centrifugal pump circulation;
(Q) Single-cylinder (horizontal) internal-combustion motors;
(R) Single-cylinder (vertical) internal-combustion motors;
(S) Double-cylinder (opposed) internal-combustion motors;
(T) Three-cylinder (vertical) internal-combustion motors;
(U) Four-cylinder (vertical) internal-combustion motors;
(V) Four-cylinder (revolving) internal-combustion motors;
(W) Six-cylinder (vertical) internal-combustion motors;
(X) Eight-cylinder (vertical) internal-combustion motors;
(Y) Twelve-cylinder (vertical) internal-combustion motors;
(Z) Sixteen-cylinder (vertical) internal-combustion motors.

The history of the automobile industry records many intense controversies involving the divers methods employed from time to time, and as memory goes back over the foothills of a great industry, there are many reminders of the intensity with which the various advocates stood by their guns and fought for what they thought was right. Unfortunately for the majority of them, the hard grind under practical conditions eliminated the unworthy ideas, and while it cannot be claimed that the automobile industry as it stands at the present time spells finality, the fact remains that of the 26 possibilities, as herein set forth, but few of the examples will be found in the automobiles as they will be exhibited at the Coliseum in Chicago.

(A) Steam Power Plants Reduced to Working Level

The first blush of success in the industry carried with it a brief for the steam power plant, but in those days the internal-combustion motor was looked upon as utterly impossible, due to the fact that it would not run under speed-changing conditions, it could not be reversed, and transmission gears were crude devices with but small promise. In the earlier types of steam engines there were representatives from all the schools of design; the single-expansion engine was there in both single and double-acting form; the simple compound engine had its representatives, and those who advocated triple-expansion work were overrun by the advocates of the quadruple-expansion steam engine. But they all hung by the same rope; the steam boiler with all its refinements was found to be totally inadequate, and the method of building the fire under the boiler was so troublesome that there were times when to abandon the whole problem seemed to be in the line of least resistance. In the long run, steam power plants were rendered possible, due to improvements in boiler work involving the "flash" boiler, in which a bomb-like structure was maintained at a high heat, and the water was led in in the bare quantity necessary to flash it into steam as fast as it was required by the engine for power purposes. This idea, coupled with a vast number of improvements in point of detail of steam engines and the auxiliary equipment, not forgetting the use of liquid fuel after suitable burners were contrived, maintained a position of eminence, and in one form or another it was the underlying principle of the successful steam automobiles as they obtain at the present time.

(B) Electric Power Plants Were Much Ramified

The success of the electric motor in trolley car and other railway transportation work lent encouragement to those who espoused the cause, but they overlooked the fact that the motors used in trolley-car work get their electricity from dynamo-electric machines which are placed on stable platforms in great power houses and that efficient steam power plants on a large scale furnish the power so that in the advance of the electric vehicle the real struggle came in connection with the storage battery, nor can it be said that success attended the efforts of the brave pioneers who adhered to their first ideals and fought along under conditions of great discouragement.

In the earlier efforts, referring to the storage battery, almost every possible form of electrochemical equipment was utilized, but for a number of years nothing seemed to promise a reasonable measure of success excepting the lead-lead type of storage battery, of which there were two schools of design, one known as the Faure and the other as the Planté. It was as far back as 1860 that Planté worked upon the type of battery which now bears his name, in which sheets of pure rolled lead were electrochemically processed to grow a coating of active material over the surfaces of the plates. The trouble with this type of battery was due to the relatively large weight of sheet lead that had to be used to obtain a sufficient quantity of active material, and the weight efficiency of the battery was far too low to serve in electric vehicle work until the time arrived when Chamberlain contrived the idea of spinning the sheets of lead, thus increasing the superficial area in the ratio of over 20 to 1, and, after the spun plates were electrochemically formed, filling the interstices of the spinnings; it was then found that the Planté type of battery was more or less efficacious in electric vehicle work.

While Chamberlain and others were busying themselves in the perfection of the Planté type of battery the Faure school of design had its busy workers, and despite the fact that this idea took root in electrochemical schools not far from 1881 it forged ahead and Charles F. Brush, of Cleveland, Ohio, who was afterward sustained in his patent rights, very accurately described the battery that is most in use at the present time. In the Brush type of battery lead-antimony grids of light construction were given a coating of a paste paint, or cement, the latter comprising the active material, and the ratio of this active material to the grid, from the weight point of view, was much enhanced. In the course of time there were hundreds of variations in the method of applying the active material, but in the long run the lead salts of which the active material was composed were compressed into briquette formation in conjunction with the lattice-work grids. But it is a matter of no moment as to the details of design and construction from the point of view of the automobilist; he will understand that the lead-lead storage battery, broadly considered, is composed of a plurality of light but strong supporting grids in conjunction with lead salts for the active material, and after these grids are formed and seasoned they are immersed in a bath of diluted sulphuric acid and so connected up that there will be one more negative than there are positive plates, the idea being to place a negative surface in juxtaposition to the surfaces of the positive plates, and when the batteries so made are charged the active material on the positive plates is formed into peroxide of lead, and the active material on the negative plates takes on the form of spongy lead. When the batteries are charged, producing the condition as above outlined for the respective plates, a current of electricity will be delivered from them when the circuit is closed, and during the discharge the peroxide of lead of the positive plates is reduced to sulphate of lead and the spongy lead on the negative plates is reduced to sulphate of lead also.

The output of a well-made lead-lead battery may be high or low in watts per pound, depending upon the weight of active material in available form, and the availability of the active material depends upon the surface exposed to the sulphion, which is a component of the electrolyte. Surface is provided, first, by having a considerable number of thin plates, and, second, by inducing a condition of porosity of the active material. In practice, in view of the desire for a low rate of depreciation, the output in watts per pound of battery was very low at first, probably down to 3 watts per pound, but as the skill of the battery makers increased with experience, the output increased to 4, 5 and 6 watts per pound until it was finally considered a safe project to so build these batteries that they would deliver at least 8 watts per pound, and as a laboratory proposition 16 watts per pound has been realized.

A cell of lead-lead battery delivers an average of close to 2 volts; the discharge starts at about 2.2 volts, and a battery is said to be discharged when the electromotive force falls off to 1.8 volts. Under the circumstances, considering efficient charging relations and the fact that the average electric lighting circuit, from which the charging is done, has a voltage from 110 to 125 volts, and in further consideration of the fact that in charging a battery it is frequently desired to run the charging voltage up to 2.6 volts per cell, it is deemed good practice to have from 40 to 44 cells of battery available in the vehicle, and this battery may be placed in four divisions with means for multiple series connections, so that by altering the divisions of the battery with respect to each other the speed of the motor may be varied at will, and the necessity of employing a speed-changing device other than this becomes unnecessary.

In some cases the number of cells of battery employed is reduced to even as low as 10 or 11, but in these combinations some form of charging equipment must be employed by means of which the voltage of the charging circuit may be regulated to the needs of the battery, and this involves a loss of energy which must be counted when the questions of economy are uppermost.

In latter days the Edison nickel-iron battery entered into competition with the lead-lead type of battery, and it is obvious from experience thus far gained that the Edison type of nickel-iron

battery, as described in complete detail in THE AUTOMOBILE within the last few weeks, promises to revive interest in electric vehicles and put this part of the industry upon a plane as never before.

(C) Constant-Pressure Type Unsatisfactory

It will scarcely be necessary to more than mention this type of internal-combustion motor. It was brought out originally in what was known as the Brayton engine, which was accepted by Selden in his combination patent, and owing to the poor thermal conditions that obtained under constant-pressure conditions the power for weight has been found too low to compete with constant-volume types of motors in automobiles, and, for that matter, other power purposes.

(D) Constant-Volume Types of Motors Prevail

The best known type of constant-volume motor is that of the Otto cycle, in which the four strokes of the piston give the relations as follows:

The gas is taken in on the suction stroke; it is compressed during the succeeding compression stroke; it is then ignited and expanded in the combustion chamber under conditions of constant volume, following which the expansion stroke takes place, only to be succeeded by the scavenging stroke. This motor is accurately described as the four-stroke cycle motor, but in the parlance of the day it is known as the four-cycle motor. Motors of this generic type are made in all the well-known styles, both for air and water-cooling, and under the best conditions in practice the thermal efficiency reaches an average which is not far from 20 per cent. out of about 38 per cent. Under laboratory conditions this type of motor has been known to deliver approximately 28 per cent. of the fuel value in actual power, but the automobilist of acumen is permitted to exercise his ingenuity, due to the fact that a poor motor will deliver power on a thermal basis which may be as low as even 8 per cent, and it is claimed by many experts that the average thermal efficiency of the four-cycle motor, so called, is about 16 per cent.

For the benefit of those who have not given the matter sufficient study to be able to appreciate what is meant by the compound term thermal-efficiency it is enough to say that the hydrocarbon fuel (automobile gasoline) holds from 18,000 to 20,000 British thermal units of energy per pound, and of all this energy which is represented in the gasoline required in the operation of a motor only about one-fifth of it is turned into mechanical work. This might look like a poor result in the estimation of the novice, but it is not necessary to harbor feelings of despair. The average high-speed engine, of which there are hundreds of thousands in operation, is doing fairly well if it delivers from 8 to 10 per cent. of the thermal value of the coal consumed, and the best results obtainable from the largest engines used under constant loading conditions in steamships barely equal the results obtained under average conditions in automobile work.

Designs Are from Several Points of View

That there is a wide opportunity for the display of ingenuity on the part of designers of internal-combustion motors of this type is shown from the fact that practically every motor used in the respective makes of cars differs in some important particular from its neighbor, and, as viewed by the novice, these differences are well beneath the surface. The constant-volume type of motor varies in efficiency, both as to weight and in a thermal sense, depending upon compression. But the allowable compression depends upon the type of fuel employed. Where it might be good practice to fix the compression at 150 pounds per square inch absolute, in the burning of alcohol as the fuel it would be an impracticable figure when reference is had to automobile gasoline. Referring to this latter type of fuel, the maximum compression is well within 120 pounds per square inch absolute, and the average racing type of motor has a compression which is well within 95 pounds per square inch absolute, but the average touring car motor has its compression value in the neighborhood of 75 pounds per square inch absolute, and it will be remembered that the absolute pressure is 14.7 pounds per square inch above the pressure as shown by a gauge. In other words, the pressure of the atmosphere, which is 14.7 per square inch, must be added to the pressure as shown by a gauge in the determination of the absolute pressure.

Fixing the compression in a motor of this type is an extremely important detail; if the motor is to be run under racing conditions, thus requiring high speed nearly all of the time, remembering also that the low-speed demand is unimportant, it remains to have the compression as high as possible, for then ignition will be under the most favorable conditions, since the rate of flame travel in the mixture will be maximum and the energy that will be absorbed from the burning mixture in a mechanical sense will not only be relatively great, but it will also be under the most efficacious conditions. It is unfortunate, perhaps, that this high compression stands in the way of flexibility, so that motors that are designed for racing work are not looked upon as particularly favorable under normal working conditions.

What automobile engineers have in mind in fashioning a motor is to establish a zone of stability of the greatest possible magnitude, if the motor is to be used in general work, so arranging the thermic relations that the motor will deliver power at the lowest possible speed, on the one hand, maintaining its flexibility and continuing to deliver its power up to the highest possible speed, on the other hand. Fig. 1 is a chart giving the speed of the motor in revolutions per minute as ordinates and the horsepower, or full pounds, in other words, torque as abscissæ. This plan, which facilitates the plotting of the characteristics of a motor, seems to have been the idea of Leon Lacon, who wrote upon the subject in *Omnia*, and later on the idea was enlarged upon by B. D. Gray, a member of the S. A. E., who said: "I believe that flexibility is the most important consideration."

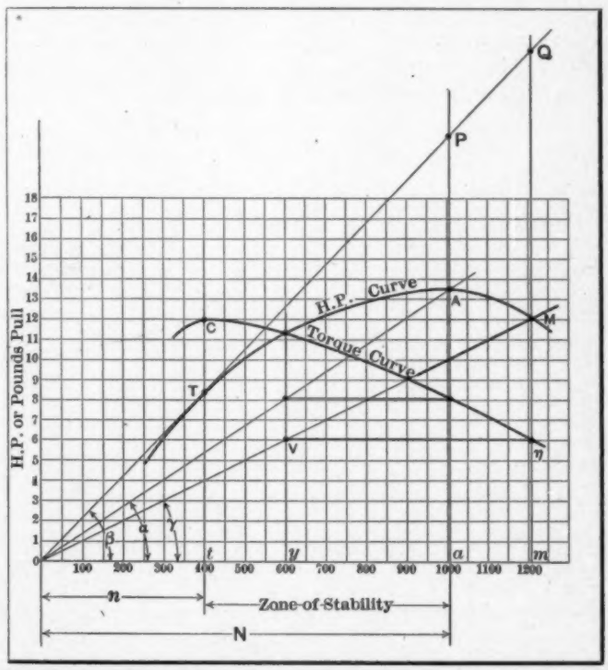


Fig. 1—Chart contrived to show the zone of stability of a motor when the torque and speed are known

The explanation of the workings of the chart, Fig. 1, as referred to by Mr. Gray is as follows:

Graphic Representation of Flexibility of Motors

$\frac{Pa}{Aa}$ — represents flexibility of motor at normal speed N.

$\frac{Qm}{Mm}$ — represents flexibility at speed Om.

The horsepower and torque curves may be plotted geometrically one from the other, without calculating each point. Join point M on horsepower curve with O point. The triangle OMm gives tang. $\alpha = \frac{Mm}{Om}$

Mm represents the horsepower at speed Om. Therefore, the quotient of the horsepower and revolutions per minute is proportional to the torque, since T (torque) $= \frac{HP}{N} \times \frac{33{,}000}{2\pi r}$

That is, tang. α represents the torque, which is, therefore, measured on the diagram by y v. The ordinate y v is located at the intersection of the torque and horsepower curves, and the scale represents pounds pull, or horsepower, and the length of brake arm must be made such that the curves intersect. (This is only a matter of convenience; practically there is no reason for it other than that.) Carrying y v to the ordinate Mm the point η is obtained, representing the torque at speed Om. Note that maximum torque is obtained when α is maximum; that is, when the line Om is tangent to the horsepower curve, and the torque curve indicates that the maximum torque is at C (where the tangent is horizontal). The horsepower is maximum at A. Between n and N, corresponding to C and A, is the "zone of stability."

It is interesting to note in what way the information thus obtained regarding the performance of a motor may be utilized in determining the gear ratios of an automobile.

Designing Gear Reductions

Gear reductions in transmissions should be so designed that speed changes will keep the motor within the "stable zone," i.e., as resistance increases and motor speed decreases to "n," a change to the next lower gear will permit a motor speed of "N" without change of vehicle speed. Hence neither racing nor stalling of motor. That is, in ascending a hill, for example, one starts at the bottom of a hill at, say, a speed of 1,000 revolutions per minute, and the vehicle speed is reduced gradually until the motor speed coincides with the point of maximum torque, which, we will say, is 600 revolutions per minute. The gear reductions should be such that on changing to the next lower gear, without changing the vehicle speed, the motor speed will return to 1,000 revolutions per minute; and so on throughout the various gear changes. It is a dangerous thing to allow the motor to so reduce in speed that the torque will be advanced beyond the capability of the material used.

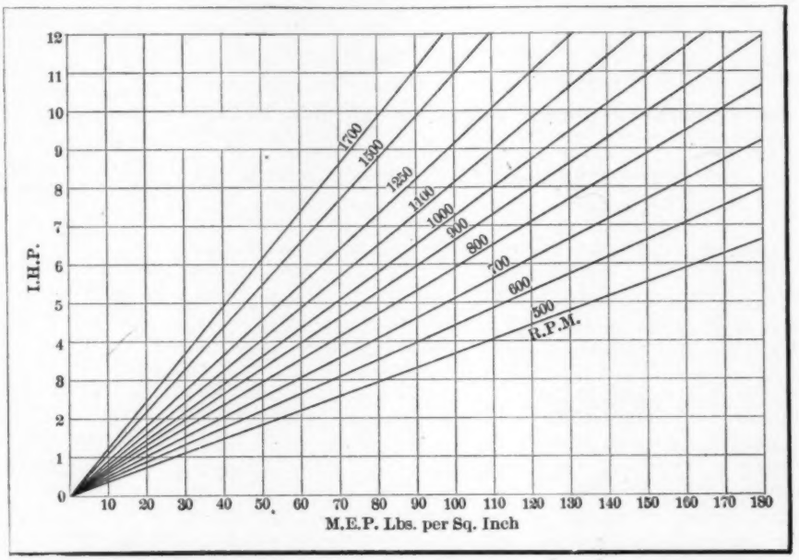


Fig. 3—Chart designed to show the relation of the indicated horsepower to the mean effective pressure of a motor

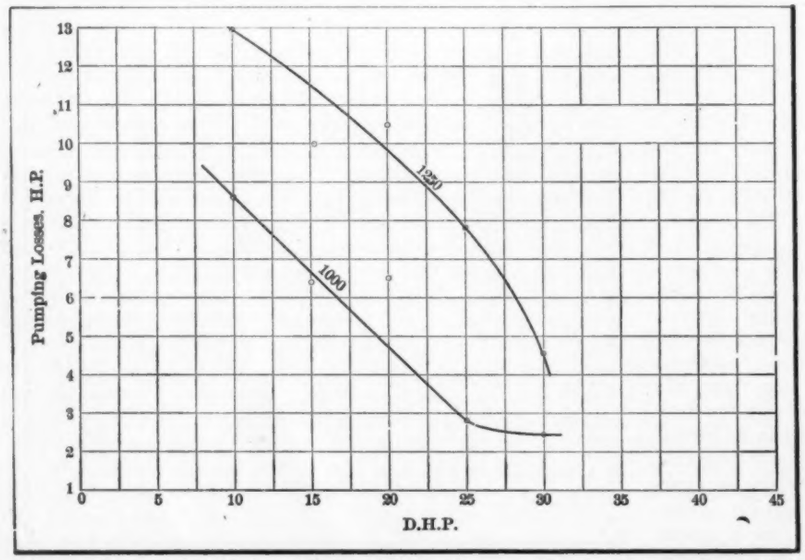


Fig. 2—Diagram contrived to bring out the extent of the pumping losses as they relate to the delivered horsepower of a motor

Motor Flexibility

Flexibility of the motor is represented by

$$s = \frac{N}{n} \times \frac{w}{W}$$

N = the normal speed.

W = the maximum power.

n = revolutions per minute which gives maximum torque.

w = power corresponding to speed giving maximum torque.

Theoretically, gear reduction should be as follows:

v_1, $v_1 \times s$, $v_1 \times s \times s$, $v_1 \times s \times s \times s$, hence the reason for geometrical progression. On account of air resistance the high speeds must be less than gear reductions indicated.

With the horsepower curve and taking the tangent from the origin O, the right angle triangles O P a and O T t give:

P a = O a tang. β

A a = O a tang. α

It is known that the tangents measure the torque, and that the ratio of the torques considered represents the flexibility of the

$$\frac{P\ a}{A\ a}$$

meter; hence — represents the flexibility.

and

$$\frac{P\ a}{A\ a} = \frac{\text{tang. } \beta}{\text{tang. } \alpha}$$

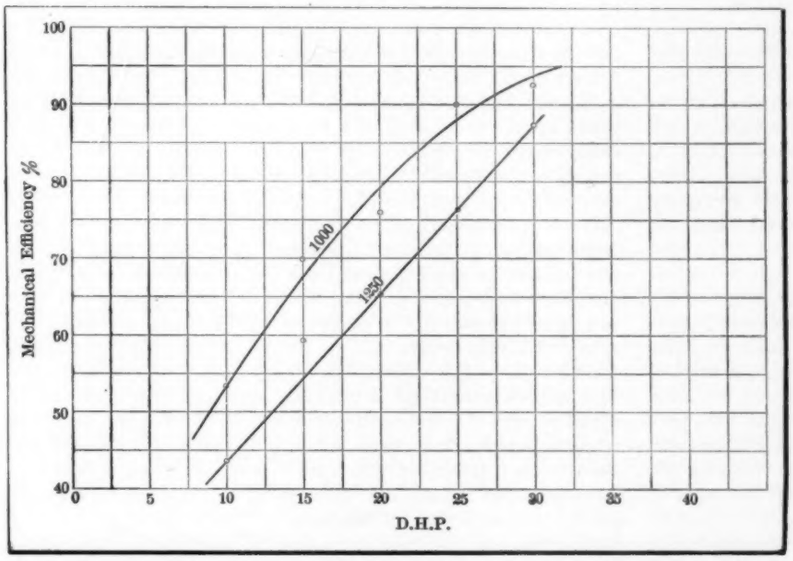


Fig. 4—Diagram designed to show the approximate thermal efficiency of a motor at different power deliveries

Flexibility, so called, usually varies from 1.2 to 1.5. It should be possible to obtain a flexibility of 1.6. In actual practice the apparent flexibility is increased by racing the motor before shifting to a higher gear, as will be appreciated by the driver of experience. This is represented on the curves by O m, representing a speed greater than "N." If speed changes are made in this way "s" becomes $\frac{Q\ m}{M\ m}$.

Foot Note—It was Mr. Gray's main idea to suggest a possible form of motor characteristic curves, and it was hoped that discussion would bring out many valuable points, which would assist the committee appointed to investigate the subject in formulating such recommendations as to character of curves and method of conducting tests for standardizing same as would meet with the approval of all members of the S. of A. E.

(E) Referring to the Air Cooling of Motors

Since barely 20 per cent. of the thermal value of the fuel is turned into mechanical work, all the rest of the heat must be disposed of in some other way, or the parts of the motor will continue to heat up, and it would be theoretically possible to say that in the absence of any means for dissipating the heat the cylinders and other relating parts of the motor would melt. One method in vogue for taking care of the waste heat is to have large exhaust valves, and to direct the heat out through these valves and to the atmosphere by way of the exhaust pipe, a muffler being placed at the end thereof for the purpose of reducing the sound. In order, however, to direct as much of the heat as possible out to the exhaust transfer ports and away to the atmosphere, it is necessary to limit the flame-swept surface of the combustion chamber in each cylinder as much as possible, it being the case that the heat cannot pass through the cylinder walls only at a certain rate, and this rate is directly proportional to the area of the flame-swept surface for any given temperature. The least amount of flame-swept surface is available when the dome of the cylinder is of spherical conformation, and in the better class of air-cooled motors, so-called, the spherical shape is adhered to quite closely. In referring to the air-cooled motor, it would have been better, perhaps, from the nomenclature point of view, to call it a natural cooling system of disposing of the waste heat. At all events, in the air-cooled motor the idea is to draw air over the exterior surfaces of the cylinders at a sufficiently rapid rate, in view of the specific heat of air, and the ruling temperatures, to make it the carrier of all the waste heat that passes through the cylinder walls, thus maintaining the temperature under working conditions at the point which will assure freedom from heating troubles, and the highest thermal efficiency besides.

In some motors the cylinders are cast with fins or a succession of ribs, the idea being to increase the surface to the greatest possible extent, limiting at the same time the area of the combustion chamber surface within. In this way the heat is prevented from passing out by the limited flame-swept area to the maximum extent, but the increased surface of exterior permits of ridding the metal of its heat at a sufficiently rapid rate to keep the cylinder walls cool enough for working purposes. There are quite a number of drawbacks, and under certain conditions it is found difficult to maintain a satisfactory working temperature. In the Frank-

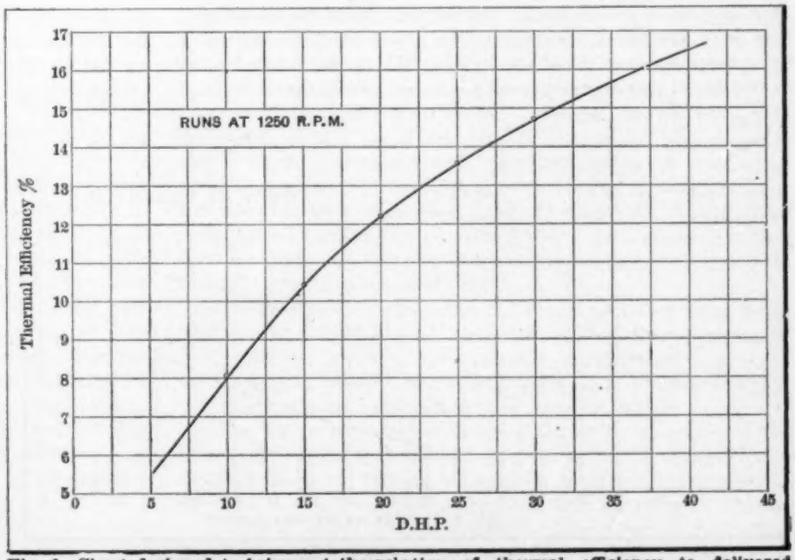


Fig. 6—Chart designed to bring out the relation of thermal efficiency to delivered horsepower of a motor

lin type of motor some 70 per cent. of all of the waste heat is permitted to escape through an auxiliary port at the bottom of the stroke, and of the remaining waste heat a considerable part of it passes out through the regular exhaust valve, leaving a relatively small balance which has to be disposed of by means of the cooling air. In the Franklin type of motor the cylinders are cast with a series of vertical ribs, the latter being of sheet steel, and by a process which has been especially contrived in the foundry the sheet steel ribs are in molecular relation with the iron of the cylinders, and around this arrangement, with its large cooling surface, a jacket is placed, and the cooling air is distributed in sufficient quantity on an equal basis to the respective cylinders, so that they are all maintained at the same working level of temperature.

In air-cooled motor work, it is of unusual importance to fix a nice relation of the reciprocating parts to the cylinders, and to maintain the temperature below the disintegrating point of the lubricating oil. If the pistons are too tight in the cylinders under working conditions, and if other relations are awry, the pumping losses will foot up to an awkward total, and this phase of the problem must be given unusual attention by designers, in view of the relatively low specific heat of air, and further to the fact that air-cooled motors have not the advantage which is due to the fixed temperature of water as it obtains in water-cooled work. Fig. 2 shows the pumping losses in a Franklin motor at two speeds, i. e., 1,000 and 1,200 revolutions per minute, and since this chart is so contrived that the ordinates read the delivered horsepower, it will be possible to note the influence upon efficiency in view of the fact that the pumping losses are given as abscissæ reading horsepower. At 1,000 revolutions per minute the pumping losses are approximately 2.8 horsepower when the motor is delivering 25 horsepower, and these pumping losses increase as the actual delivery of power decreases, reaching a total of 8.7 horsepower when the motor is delivering but 10 horsepower. When the speed was increased to 1,250 revolutions per minute in this case, the pumping losses footed up to 4.6 horsepower when the motor was delivering 30 horsepower, and these pumping losses increased to 13 horsepower when the motor was delivering but 10 horsepower.

In referring to the pumping losses of a motor it is just possible that there are some readers who will not quite appreciate what it means, but recalling the statements in counting the four strokes of the Otto cycle it will be remembered that only one of them was a power stroke. It will of course be understood that there are losses even during the power stroke, but it must be self-evident that the three strokes that do not add a quota to the useful power delivery do represent losses, and it is common custom to refer to them as pumping losses. There is one other point that will be referred to for the benefit of those who have not made a study of gasoline engine work. This point is quite clearly depicted in Fig. 3, referring to the relation of the indicated to the delivered horsepower of a motor. When a manograph, which is an instrument for use in determining the working conditions in the cylinders of a motor, is properly attached, it will show, in other words indicate, the work that is being done by the expanding gas in the driving of the piston outward on its stroke, and by suitable computation it is possible to figure the horsepower of the motor, utilizing the indicator card which the manograph is used to produce, since it shows the pressure of the gas in pounds per square inch at every instant of the travel of the piston on its power stroke. Moreover, the indicator card so taken shows the suction pressure which counts as a loss of the pumping variety, and any malconditions that might obtain, due to the poor timing of the spark, bad mixture or inefficient cooling relations. Referring now to Fig. 3 it will be observed that the mean effective pressure in pounds per square inch, which is what the engineer computes from information given on a manograph card, is given as ordinates in the chart, and the indicated horsepower values are plotted as abscissæ. The diagonal lines represent the several speeds at which the motor in this case was run when the manograph cards were taken, and while this particular chart does not give the definite mean effective pressure an actual test, it does permit the interested investigator to ascertain at a glance what the indicated horsepower will be when the mean effective pressure is known. As an illustration of the use of this chart, it is pointed out that with a mean effective pressure of 70 pounds per square inch, at a speed of 1,000 revolutions per minute, the indicated horsepower of the motor would be 5.1 horsepower approximately. Likewise, considering the same mean effective pressure, at a speed of 1,500 revolutions per minute, the indicated horsepower would be 7.6 approximately.

The indicated horsepower of a motor cannot be the measure of the actual horsepower delivered by the same, due to the fact that the mechanical losses inherent in the motor are not indicated by a manograph on the card that it traces. Referring to Fig. 4 of a chart showing delivered horsepower (D. H. P.) as ordinates, the mechanical efficiency is given in the scale of abscissæ in per cent., and the curves are plotted at 1,000 and 1,250 revolutions per minute respectively. Taking the motor at 25 delivered horsepower and 1,000 revolutions per minute, the mechanical efficiency is substantially 88 per cent, so that 25 divided by .88 brings the indicated horsepower up to 28.4 approximately, and the difference between 25 and 28.4 represents the mechanical loss in the motor. The curve Fig. 4 shows a considerable difference in the characteristics under speed-changing conditions, and designers of motors are accustomed to considering the effect of speed, remembering, of course, that increasing speed with or without an increase in power has a marked bearing upon the necessity for precise conditions of lubrication.

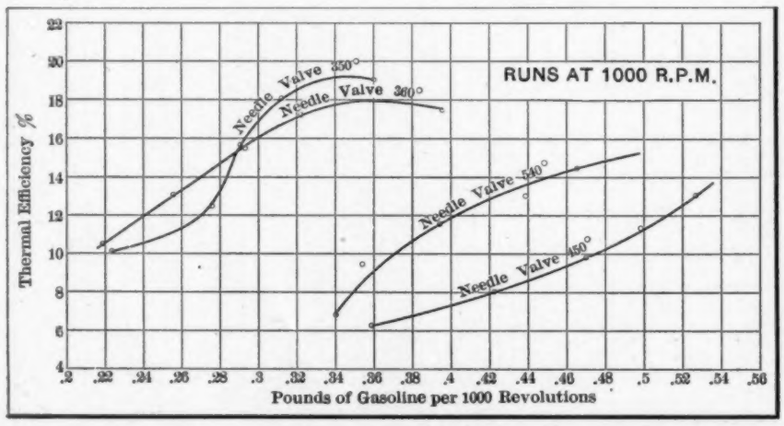


Fig. 5—Diagram depicting the effect of changing the flow of gasoline from the nozzle of the carbureter

In discussing the thermic relations with particular reference to the cooling problem, it is important to remember that the heat comes from the fuel, and, this being true, it is impossible to go on with the discussion along intelligent lines without considering the problems of carburetion to a very great extent, or to the disregard of the influences of timely ignition. In order to show that the thermal efficiency varies in a marked way with the quantity of gasoline taken in under different condi-

tions of speed and for different adjustments of a given carbureter, the chart Fig. 5 is presented in which the pounds of gasoline per 1,000 revolutions of the crankshaft of the motor are given in ordinates, and the thermal efficiency is set down on the scale of abscissa in per cent. In this case the motor was run at 1,000 revolutions per minute, and the needle valve of the carbureter was adjusted, it being marked off in degrees as a convenience, so that when the needle valve was adjusted to 350 degrees as shown, the best result was obtained with a consumption of 3.4 pounds of gasoline with a thermal efficiency of 18.6 per cent. The poorest result was realized when the needle valve was opened 450 degrees, when the thermal efficiency fell away to 6.15 per cent., with a gasoline consumption of .36 pound. It will not be necessary to dwell here at great length upon this important phase of automobile operation; the interested reader will readily see that gasoline economy is desirable not only because the cost of operation will be reduced, but also due to the fact that the thermic relations will be improved since the motor will be freed from gasoline indigestion. The lesson to be learned from the user's point of view should be that the carbureter of a motor should be so adjusted that the amount of gasoline that will be permitted to pass through the nozzle in a given time should be the least possible consistent with satisfactory performance under normal conditions. Moreover, it is better to resort to the sliding of gears under abnormal conditions than it is to so adjust the carbureter that the power of the motor will be increased to a point where gear sliding is not necessary. This is a true statement in view of the fact that it is less troublesome to slide gears than it is to put up with a motor that has been rendered unfit for satisfactory service, due to the excess heating of gasoline all of the time for no better purpose than to save the operator of the car the small pains that it will give him to slide the gears when he comes to grades, or when the roadbed is soft, and the power requirement is increased beyond the normal level.

Under the most favorable conditions of operation the thermal efficiency will change with the power delivered by a motor at a given speed, and Fig. 6 is offered to show something of this variation. In this chart the delivered horsepowers of the motor are plotted as ordinates, and the thermal efficiency is given in per cent, on the scale of abscissa. As an illustration of the use of the chart it is pointed out that the thermal efficiency was a minimum of 8 per cent. when the motor was delivering 10 horsepower at 1,250 revolutions per minute, and this efficiency increased by gradual increments, reaching 16 per cent. when the motor was delivering approximately 34 horsepower.

(F) Leading Up to Water Cooling of the Motor

The great difficulty with the average man when he starts out to either build or use a motor lies in his child-like belief in the idea that a motor will do work because it is of a certain size, if it is lubricated, and otherwise maintained according to the conventions. Unfortunately for this way of thinking, it leaves the man in a poor state of mind for him to cope with the inevitable difficulties that are ever present, whereas were he to understand that none of the thermic conditions are very well defined, or fixed in a relation to each other, the more vigilant state of his mind would react to his advantage. For the better understanding of the problem, it will be apropos to point out a few of the more important considerations which lead to variations in power, and it may as well be understood that nearly all of the variations are in the downward direction. At all events, the following are the main points to be watched and adjusted.

(a) The temperature of cooling should neither be too high nor too low.

(b) The lubricating facilities should be such as to assure an unbroken film of lubricating oil over every friction surface.

(c) The ratio of air to gasoline should be maintained under conditions which will afford a reasonable excess of air at all speeds.

(d) The mixture should be ignited sufficiently early to bring on the complete combustion of the whole mass before the piston starts on its outward migration on the power stroke.

(e) Back pressure due to an inefficient muffler or other interferences on the exhaust side of the motor should be avoided.

(f) An undue suction depression which will be brought about by restrictions in the intake or the carbureter leads to a considerable loss of power.

In order to show that the results in practice under relatively favorable conditions are far from perfect, reference may be had to Figs. 7 and 8 of six manograph cards with the motor running at 1,000 revolutions per minute in Fig. 7, and six manograph cards with the motor running at 1,250 revolutions per minute in Fig. 8. Referring now to Fig. 7, remembering that the six manograph cards are taken from the respective cylinders of a six-cylinder motor under well regulated conditions, using water, it will readily be seen that the cards do not compare at all favorably with each other. Card 1, Fig. 7, shows an expansion pressure of a little over 118 pounds per square inch; card 2 shows an expansion of 139.5 pounds per square inch; card 3 shows an expansion pressure of 141 pounds per square inch, but cards 4 and 5 have substantially equal expansion pressures, but the area as shown by a planometer differs materially, thus indicating that while the expansion pressures may be substantially the same the area might be quite different, and the power obtainable would therefore vary as between these cylinders. Card 6 shows a poor result during the power stroke and a considerable depression during the suction stroke. Referring now to Fig. 8, card 1 gives an expansion pressure of 276 pounds per square inch, but even so the area is only 1.94, whereas in card 5, Fig. 7, with an expansion pressure of a little less than 134 pounds per square inch, the arc was 2.27, thus indicating that the value of the expansion pressure is not to be relied upon in the delivery of power, although it is worth while to remember that sudden increases in pressure to a high point are detrimental in other respects, notably among which will be mentioned excess pressure on the bearing surfaces and a disrupting influence on the cylinder walls, not forgetting that the twisting moment on the crankshaft runs up materially, and the secondary forces are more likely to react, resulting in vibration that cannot be regarded as fitting companions to a well performing motor. Card 2, Fig. 8, has a pressure of 176.5 pounds per square inch on the expansion line, with an area of 2.3 square inches, but card 4 has a considerably lower expansion pressure, and a much depreciated area with indications of augmented pumping losses. The remaining cards in Fig. 8 have much of the characteristics of card 3 excepting that card 6 was taken with the manograph out of step, which does not alter the fact that the expansion pressure was 142.35 pounds per square inch, with an area of 2.29 square inches.

As a general rule, indicator cards are published from ideal plottings, or only the good cards are selected from a series of tests, and the result is that youthful designers and users of motors permit their ideas to beat along ideal pathways, which is another way of saying that they grow to weeds.

Referring to the water cooling question as it relates to the Otto cycle motor, it is enough to say that the best results are obtained when the volume of water is beyond the point where some of it will burst into steam, and this question of volume to a limited extent may be disposed of in either of two ways, the first of which is to move a limited supply of water at a rapid rate through its cycle of heat absorption, and cooling by

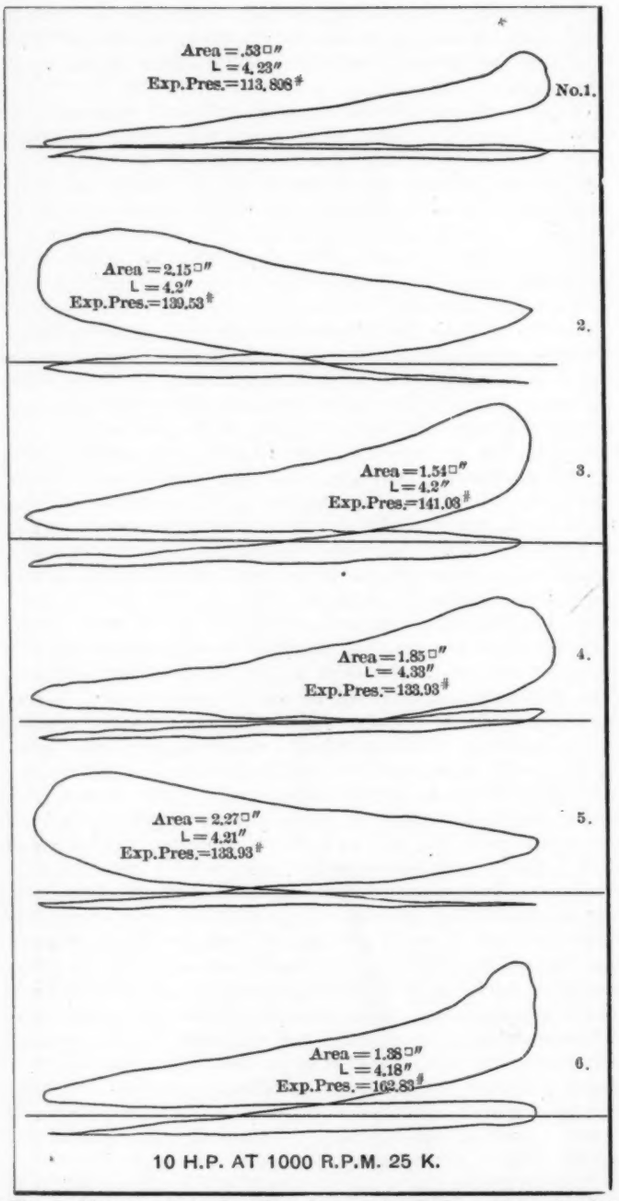


Fig. 7—Manograph cards taken from a 6-cylinder motor, showing variations in the performance

the use of a well-contrived pump, and the second method of accomplishing this end is to have a large volume of water and a sluggish circulation. It will be understood that it is the function of the water to absorb the heat from the exterior of the dome of the combustion chamber of the cylinders and carry it away to the radiator, where the air as it passes over the external walls robs the water of its heat and dissipates it in the surroundings as fast as the heat is passed into the water from the motor. If the radiator is of insufficient capacity to perform its proper functions, or if the air circulation is retarded from any cause, the water will heat up in consequence, and the thermal relations of the motor will be upset.

It seems to be desirable in practice to maintain the cooling water at or near about 202 degrees Fahrenheit, this being a temperature which is as close to the boiling point of water as it is deemed expedient to go. The water boils at 212 degrees Fahrenheit and a difference of 10 degrees, dropping it down to 202 degrees for the working level, is a practical undertaking. Admitting that there is absolutely no fixed point from the cooling water point of view at which the greatest amount of power can be taken from a motor, it remains to be said that the majority of motors seem to perform best from the power point of view when the temperature of the cooling water is maintained at about 202 degrees Fahrenheit. How to reconcile the good performance of a water-cooled motor when the temperature of the waterjacket is maintained at a temperature of 202 degrees Fahrenheit with the excellence of the results obtained from an air-cooled motor when the temperature is barely below the flash point of lubricating oil is a matter that will be difficult to explain to those who fail to note the distinction between a high thermal efficiency and an attempt at a high weight efficiency. It would seem from tests which have been shown that well-contrived air-cooled motors have the faculty of doing the required amount of work at a high thermal efficiency, and in measuring them up for the purpose of fixing their weight efficiency account must be taken of the fact that the weight of the motor is not increased by the weight of the water, the radiator, the pump and the piping. The expected high thermal efficiency of a well-contrived air-cooled motor is not marred by any serious defect when it is compared on a basis of weight efficiency.

(G) Referring to Two-Cycle Water-Cooled Motors

In a two-cycle motor, so-called, more properly termed a two-stroke cycle motor, it is deemed inexpedient to resort to air cooling on account of the difficulties involved in connection with the scavenging of the cylinders, it being the case that in this type of motor the incoming mixture sweeps over the outgoing exhaust products, and it is only possible under the most favorable conditions to remove the exhaust product of combustion with reasonable completeness; moreover, the incoming mixture absorbs some of the heat from the exhaust products of combustion so that it is difficult to get the desired weight of mixture into the cylinders, and this difficulty is considerably modified when the cooling conditions are well regulated, using a considerable volume of water with a good pump circulation.

In the two-cycle motor, while it is true that there is a power stroke for every second stroke, instead of a power stroke for every fourth stroke as in four-cycle work, the fact remains that it is not found to be true in practice that two-cycle motors will give twice as much power as that which can be obtained from four-cycle motors. Gas engineers who make a specialty of two-cycle motor building are wont to claim that the two-cycle motor will deliver power on a 1.6 basis, but even this claim is contested in many quarters. In the meantime it has been found that well-designed two-cycle motors are indeed flexible performers, and that they deliver as much power as is required by the automobiles that they are placed to propel.

(H) Four-Cycle Motors Are Most in Evidence

In order to appreciate the preponderance of water-cooled motors of the four-cycle type in automobile work at the present time, it is only necessary to refer to the cars as they were exhibited at Madison Square Garden in New York this year, in which there were 450 models that were water-cooled and 12 models that were air-cooled. It is more than likely that the greatest variation in motor work at the present time has to do with the method of casting the cylinders, and the regulation of some of the innermost details with a view to refinements such as will bring about a better thermal balance. The monoblock idea, that is to say the casting of four cylinders as a unit, has been looked upon by judges as an expedient for the sake of economy. If there is any economy in the monoblock idea it must be after the cylinders are cast and in the divers

ways that have to do with shop processes. In the foundry, the monoblock is a troublesome casting, and a large number of "wasters" amply testify to the fact that whatever little saving there is by way of economies in the reduced number of parts that have to be manipulated, it is more than offset by the number of wasters that have to be replaced by sound castings.

A closer study of the situation will probably show that the monoblock has inherent qualities which have little or nothing to do with questions of cost, as, for illustration, if the transfer ports for the incoming mixture from the carbureter are water-jacketed, it stands to reason that the spray of liquid gasoline, as it is swept in with the air, will be volatilized as it must be before it can burn, and the heat that is thus placed available for this necessary work is abstracted from the walls of the exhaust transfer ports after the exhaust gases have done all of the mechanical work that they are capable of, so that the gain is a double one, in that the waste heat is turned to good account, and in view of the fact that the gasoline is boiled before it enters the combustion chamber of the motor, and carbon formations are thereby more nearly eliminated, thus insuring a good performance of the motor for an extended length of time.

But it is not necessary to despair of having these advantages if the monoblock idea is abandoned. If the cylinders are cast in pairs or individually, as they are in a great number of cases, all that remains is to water-jacket the carbureter, and by piping the water from the water-jacket of the cylinder the same heat that is at the disposal of the incoming mixture in the monoblock cylinder will be placed at the disposal of the carbureter in the performance of its function, and the incoming mixture will be afforded its requisite measure of heat, and the basis of economy will be precisely as before.

In a sense, it would seem that the advantages of any one system are fairly well distributed, on a like basis, over all systems, and, in a sense, this is quite true. As a matter of fact, the designers of motors of the four-cycle type, if they are water-cooled, start out with the idea of realizing a certain result. Some of the designers belong to the monoblock school, others owe their allegiance to the school which practises the twin-cylinder idea, and not a few of them lay claim to the belief that individual cylinders are much to be desired. But they are all building motors, and the underlying principle of performance of the respective types of motors is on a common basis, and barring mechanical imperfections, which might be common to all, or the accidents of design, construction and workmanship, there is an even chance as between.

Due to the fact that good motors may be had out of each of the schools of design, and that bad motors sometimes show up, notwithstanding the reputation of the school from which they come, it is just a little difficult for embryo automobilists to conduct themselves with a feeling of confidence when they go in quest of an automobile. That they should be guided by the same good sense that permitted Christopher Columbus to sail to America, although he was never before in such a predicament, is all that can be said unless to point out that Columbus had a few precedents up his sleeve, and he made up his mind like a man that if a ship would go ten miles in a certain direction, and then twenty miles, the law of probability proclaimed the fact that it might reasonably be expected to duplicate these distances and go on. Of the six-stroke cycle motor to which allusion was made, it is enough to point out for the present that it is not an inspiring spectacle.

Discussing Valves and Mechanisms

In hearing so much as we do these days about sleeve and other types of valves, that are mostly conspicuous for their absence in the actual automobiles, it suggests the thought that something might be said about them, if for no better purpose than to ease the mind of the man who, knowing that he cannot buy an automobile every day, would like to be sure that the one he does select will meet its obligations. The history of valve mechanisms is quite as old as the gas engine, and, despite the murmurings of the sad sea waves, the poppet valve is bravely performing its function in over 99 per cent of all the motors that are running in America at the present time. Long before motors were placed in automobiles, rotary and other types of valves were tried out at considerable length, and the money lost in their exploitation, were it all placed in one vault, would be nearly enough to pay for the fortifications proposed for the Panama Canal.

We do not quite know to what heights these fortification costs will soar and swell when the time arrives to build them.

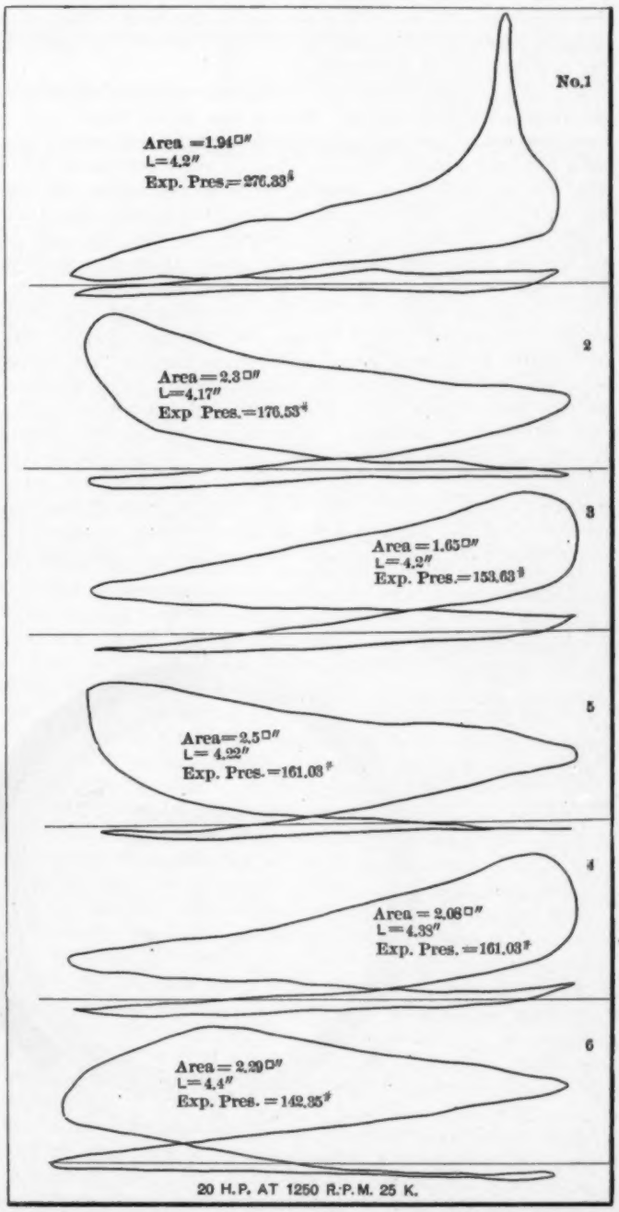


Fig. 8—Manograph cards taken from a 6-cylinder of a motor to show that the results are not the same in each cylinder

but there are records and other evidences which do adequately portray the fact that the experiments which failed in connection with valves for internal combustion motors actually foot up to millions of dollars.

When it comes down to questions of sturdy service, there are none who will deny that the poppet valve idea is thoroughly good in every reasonable way, and for the average automobile, under practical conditions of service, it is scarcely to be believed that there is any chance of its being supplanted for a long time to come. The splendid work that the poppet type of valve is doing will in no wise bar experimenters from following the bent of their own sweet wills, and some of them are presenting the evidences of quality of their workmanship, and the acumen of their business methods. Until an innovation makes its mark in the world of material things, it must be looked upon by business men as an academic proposition, if it can command the respect of savants, or it must sink to the level of ignominy if it is neither to be found in daily service nor mentioned in the conversation of the enlightened grade.

That there will be some sort of an advance in valve systems within a reasonable length of time is one of the points that is now reasonably assured, but if the improvements, when they do arrive, prove to be better in point of service to be rendered than that which is being obtained from poppet valves, the cost will no doubt be sufficiently high to debar the average man from supporting a luxury and it is fortunate that this fact will in no wise interfere with the thoroughly good results that are now being obtained from motors of the poppet valve type.

Reference was made at (L) to the automatic inlet valve idea, and quite a few of those who have had but slight contact with automobiles have gone away with the impression that poppet types of valves are not beyond trouble, due to their brief and perhaps unfavorable acquaintance with the automatic valve idea, although in fairness it is necessary to say that motors so equipped perform with extreme flexibility, if only the springs of the automatic valves are properly proportioned and maintained in a state of good adjustment. On account of the difficulty involved in maintaining the good adjustment of automatic valves, they have been supplanted by mechanically operated inlet valves, and in the majority of motors at the present time the inlet and the exhaust valves are interchangeable in size, and are operated on a common basis, excepting in the matter of timing.

Referring to mechanically operated valves, it must not be forgotten that, while they are opened in a positive way by pressure which is exerted by a cam, the fact remains that they are closed by a spring, and if the spring is lacking in any of the essential qualities the result will be poor indeed. As motors underwent the refining process and a growing measure of skill, speeds have gone up until to-day it is not uncommon to see automobile motors that operate in an orderly manner at 2,000 revolutions per minute, but it must be remembered that the valve springs which served efficaciously at 800 revolutions per minute may not have the strength and the vim which the higher speed calls for. In some of the earlier types of motors that were said to be satisfactory the valve springs were so designed that they exerted a pressure of from 36 to 40 pounds, but as refinements permitted motors to be speeded up, these pressures of springs have been increased until it is not uncommon to-day to see motors operating with valve springs pressing as much as 80 pounds. Quite a number of the motors that are said to be noisy would operate far more quietly than they do were the springs that are used in their valve mechanisms supplanted with like members, but of greater strength. It is necessary that the roller shall be held firmly to the face of the cam and when the speed of rotation of the camshaft is high and the spring that does the pressing is lazy it is too much to expect of it that it will perform its proper functions satisfactorily, but the noise that is made when the roller leaves the cam under high speed conditions is so disguised in its character that the average ear fails to discern the source.

In the Timing of the Valves of the Motor

If it may be taken for granted that the valves are of the proper size and suitably designed with stout springs holding them in place excepting when they are lifted by the cams it still remains to so time the valves that they will do their proper work agreeably to the cyclic relations and to the fact that a well-behaved motor must deliver its fair measure of power throughout its zone of stability over the widest possible range of speed. There is no doubt about motors being able to perform in a good and sufficient manner, notwithstanding changes in the timing, but there are danger zones on both sides of the line, so to say, and it remains for automobilists to check the timing of their motors and try to persue a middle course, so that the work once done will suffice for the intended purpose for the greatest possible length of time. Fig. 9 shows the timing of the Model M Thomas motor, in which the arrow within the circle shows the direction of rotation of the flywheel, and it is stated on the figure that the inlet valve opens 1 3-4 inches past center on the upper end of the stroke, which measurement is equal to 10 degrees as marked off on the flywheel. It is also stated that the inlet valve closes 5 1-4 inches past center on the lower end of the stroke, which measurement is equal to 30 degrees as measured upon the flywheel. The exhaust valve opens 7 inches before center on the lower end of the stroke,

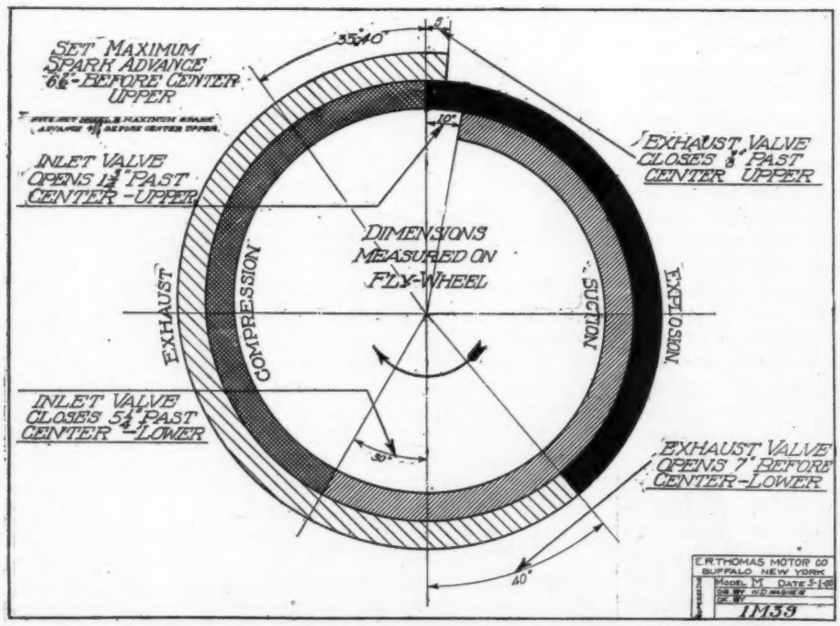


Fig. 9—Timing diagram of a Thomas Model M Motor, showing the timing relations and when the spark is fired

which measurement is equal to 40 degrees as measured upon the flywheel, and the exhaust valve closes 7-8 of an inch past center on the upper end of the stroke, which corresponds to 5 degrees as measured upon the flywheel.

In motors in general, while it is true that the exhaust valve should close concomitant with the opening of the inlet valve, the fact remains that in certain types of high-speed motors the exhaust valve is held open during a part of the time that the inlet valve is open. In other examples the inlet valve is opened simultaneously with the closing of the exhaust valve, and as a general proposition it is safe to have the opening of the inlet valve timed the same as the closing of the exhaust valve, and even then there will be a slight interval during which the inlet valve will be closed prior to the opening of the exhaust valve on account of lost motion, and the older the motor is the greater the lost motion will be, so that in timing more or less worn-out motors it is possible for the adjuster to display a little judgment with a fair chance of realizing a profit thereon.

The Modern Trend of the Automobile Motor

Owing to the lack of mechanical refinement and to the scarcity of suitable materials the earlier practices in the building of automobile motors were such as to limit the attainable speed under profitable power conditions, but it came to pass as experience was pyramided that the working speeds were increased with safety and the mechanisms were so adjusted that the power increased more nearly in proportion to speed, so that the motors used in the 1911 makes of automobiles are relatively high-speed affairs and they deliver power on a basis which is noted not only for its maximum, but for the stability with which it maintains over a wider range of decreasing speed than practice dictated heretofore.

It is fortunate that motors do perform so admirably at the higher speeds. The twisting moment which is induced in a member is far greater if the speed is low and the chances of disrupting that member increase in a proportion that exceeds the increase in the twisting moment. It is for this reason that most automobilists have to pay for their folly in a measure equal to the price of a crankshaft if they continue to stall their motor on a hill rather than to slide the gears and maintain the speed of the motor at a point sufficiently high to protect the crankshaft and relating members from an excess of the twisting moment. Despite the fact, then, that the secondary components increase with the square of the velocity, which is another way for saying that a motor is strained to excess if the speed is increased beyond a certain point, it remains to be said that if the motor is well designed and the materials of which it is composed are up to present available quality the motor will be protected from the ills of excess torquing, and this is brought about by a suitably contrived gear ratio, and the automobilist, although he should slide his gears when the occasion requires, is protected from himself to an extent that is far greater than it ever was before.

Referring to the modern idea of ignition work it is not too much to say that there is a positive gain when two sparks are simultaneously fired at the proper time as compared with one spark at the same time. True, if one spark is fired in a more advanced position the same result is more nearly approximated, although it does look as if there is to be a gain of some moment by utilizing two sparks instead of one, and the experiments that are now being conducted along these lines, while they are far from complete, are not only very interesting, but they compel the attention of advanced engineers and that we have heard the last of this idea is scarcely to be taken for granted.

In the meantime, it may be timely to warn those who have invested in motors that are provided with a means for one spark at one time that the strain upon the bearings and other parts is very considerably increased when two simultaneous sparks are employed, due to the fact that the expansion pressure is increased at least 50 per cent. in good examples of this work, and it is just possible that motors which were built for the conventional method of sparking might be subjected to an excess strain were they fitted out with a double sparking equipment. It is probably true in some cases that the cylinder walls are too thin to withstand a 50 per cent. increase in pressure and it may be that the crankshaft and other bearings will scarcely survive such an increase in the work allotted to them. Then again the crankshaft that is heavily burdened under ordinary conditions may twist off if an extra burden is imposed, and so we may conclude by pointing out that the motor which is working in a proper manner with a single spark is entitled to better treatment than that which would fall to it were a double sparking equipment imposed upon it.

Wrong Trade Methods

American Salesmen Have Something to Learn In Opening Up Foreign Territory

PEOPLE who live in foreign cities frequently refer to the American methods of trading. In making these comments they now and then drop a hint which, even if it must be taken with a grain of salt, cannot fail to prove of value to American manufacturers with ambition to build up new trade connections with other countries. For example, the residents of cities where foreign tongues are spoken expect to be conversed with in their own language. Whenever a European manufacturer desires to secure the automobile trade of a foreign land he assigns a salesman who can speak the language of the nation with which his house hopes to establish trade relations. American manufacturers expecting to sell automobiles in Rio de Janeiro, Brazil, will find it necessary to send a salesman with a complete knowledge of the Portuguese tongue; for while Spanish is spoken here, Portuguese is the recognized vernacular of the country. Even after the manufacturer has filled this obligation he will be obliged to compete with European makers of automobiles.

While it may not prove to be a palatable morsel, complaints come from Para, Brazil, that American automobile manufacturers do not stand by their machines. American automobiles have been sent to Para; not all of them have done the work that was expected of them. This is not casting any reflection on the machines as a whole, but the fault is due to the fact that the machines being new they were not understood by the purchasers, or by their machinists or drivers. There was nobody on the ground familiar enough with the machines to assemble and adjust the parts. Consequently, one disappointment of this sort led to the loss of a dozen sales of American-made cars. French machines were shipped in to supply the demand. The French proved their commercial foresightedness by sending a competent machinist with each automobile ordered—one who spoke the Portuguese language. He was also able to demonstrate the machine. Before the first car demonstrated had been on the street a week the agent representing the French firm in Para received orders for five more cars. He cabled the French house and they shipped the machines to Para by the first steamer. Other sales followed in rapid succession.

The house, seeking the South American automobile trade should be in a position to sell any sort of a commodity from an automobile to a house-to-be-built in sections. It is a mighty poor country for a tenderfoot salesman. None but the highest caliber of salesmen can hope to make good.

How to Get a Second Invitation

IT IS THE PLAIN DUTY OF THE INVITED GUEST TO BE SATISFIED WITH ALL THE PROVISIONS MADE FOR HER COMFORT

Do not, I beseech you, depend on your hostess for automobile clothes

IF your friend with an automobile does not invite you out as often as you might reasonably expect, just give the matter a little consideration, and you may be surprised to find that possibly the fault lies largely with yourself. Of course, there are all kinds of people, but the wise guest will study her friends and adapt herself to their varying moods.

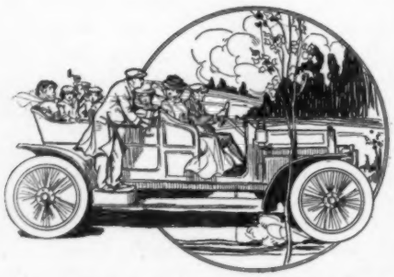
Your host, for instance, may come for you fresh from some perplexing business problem that has cost him many hours of anxious thought. He may welcome lively chatter for a change—but more likely until such a time as fresh air, changing scene and the pleasure of driving a smooth engine have cleared away the mental cobwebs he will appreciate a sympathetic silence.

Moreover, when you do talk, as you sit beside him, turn your face directly toward him so that the sound waves will strike on his ear. The rush of air past his head in fast driving acts like a curtain, effectually cutting off an otherwise directed voice.

Your hostess may drop in unexpectedly to take you for a short drive. She may be tired from a morning's shopping, or a siege with her dressmaker, and have come out for an hour's recreation. Her good nature will not permit her to enjoy her car alone and she thinks of a friend to whom she can give a treat. Do not, then, ask her to take you on that errand you had just contemplated. Drop your affairs as she has dropped hers, for otherwise, although she may smilingly accommodate you, she will be pretty apt to cross you off her list and next time take some one else.

Also let her take the initiative in suggesting both the way and the destination, keep to yourself any fears of delay or break-down, and get what pleasure you can out of the ride, wherever it leads.

If you are invited for a long trip, ascertain first the exact amount of space that can be given your baggage, and then—above all things—do not exceed it. It may seem a little thing to carry that extra big fur coat, or to add at the last moment that small second grip; but the driver has a lot of things to pack that you never would think of; he has to figure on every available inch of room, and your additional belongings might act as the proverbial straw.



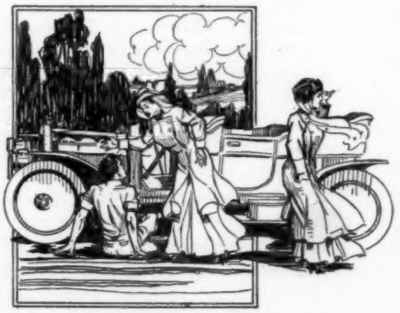
That highly polished tool-box is the most convenient place for the thoughtless man to stand

Should there happen to be a light load, so that you can place your effects as you please, be particularly careful to pack so that they will not slip and rub around, wearing on the upholstery, or scratching the varnish. Although the owner will probably be too polite to make any comment in case of an accident of this kind, he will surely do a lot of thinking, and it will not be in your favor. The handsomer the car, too, the more pains he takes to keep it perfect, and naturally he feels almost as a personal slight any disregard of his fine machine.

That highly polished toolbox, on the running-board, is a most convenient place for a thoughtless man to stand for a short run in a loaded car, but the marks of his heels may keep his host from ever asking him out again; the mahogany door-top may shine like a mirror, but if some small boy hammer it in ecstasy of joy children in the future will probably be under a ban.

Even if you are successful with snap-shots, leave your camera at home unless you are sure that your friends are interested in photography. Seldom do two people agree, any way, on the desirability of a given subject; and what you would want most they would care for least. Then, too, it takes times to select position, get right focus, and settle down afterwards, and the driver meantime may be fuming inwardly. In short, one picture might prove the cost of another pleasure trip.

Of course, you know enough to be ready on time. Even if you sit around waiting in hat and coat for half an hour, never mind; your host has privileges as well as troubles of his own. The oil man may have failed to arrive with the ordered gasoline, or the cook may have been late with his dinner, but you cannot afford to run any risks of spoiling your chances by keeping him waiting for you.



Exercise every bit of tact you ever were blessed with

When you step into the tonneau, if you happen to be the only passenger, do not sit down directly behind the driver, but on the opposite end of the seat. He then can speak to you the more easily and he will appreciate the even distribution of weight on the springs. If you find he appears to be trailing along in the dust of a forward car be patient and don't complain. He may be running full power to keep ahead of those following and he will get to the front if he possibly can, if only to prove the superiority of his own machine.

In case of a breakdown repress that natural inclination to ask why. Perhaps he would not care to confess that he could not tell off-hand, yet he would not like to make a mistake. The difficulty is not always apparent at first glance and may take some time to locate; but if you will considerately refrain from asking embarrassing questions he will have a chance to think the thing out and surprise you by showing how clever he is.

Never criticise the man at the wheel, whether host or chauffeur. He has to think and act quickly and moves according to his best judgment. Whether you approve or not, keep still; if you don't like the driving it is your privilege to decline to go again. It is most confusing, however, to have several people excitedly giving directions at once in case of an emergency. Especially in case of speeding, when the arm of the law encased in the blue sleeve of a policeman calls a halt, every one should keep still and let the driver make his own explanations.

His business it has been to keep an eye on the speedometer.

If your hostess has provided a roadside lunch, however much you enjoy it, leave something over. You will have all the better appetite for the next regular meal—and you may be glad later in the event of a blow-out. There are many little things that a guest can unostentatiously carry in a handbag that will prove most acceptable where meals are delayed and the hostess whose car breaks down between towns will appreciate any such thoughtfulness on the part of her company.

Do not, I beseech you, depend on your hostess for your automobile clothes! It is very natural to make the excuse that you go so seldom you have neglected to provide yourself with what you need, but guests have little idea of the demand made in this way upon the owners of machines. So, though you are likely to be asked only a few times in a season, get a long, serviceable, light coat, a small hat that fits closely to your head, and a nice, full veil. These things will last a long time and you will find they can be worn on many other occasions, too, but you will have the satisfaction of knowing that your own things are becoming. Also you will probably make such a good impression by your appearance as well as your thoughtfulness that you'll be invited twice as often as ever before!

You need not be afraid to wear pretty clothes, either, because you expect a dusty drive. The right kind of a coat—cravennette, linen or pongee—will keep out the dirt, and you (and your hostess) will not feel ashamed if she takes you to a nice place for dinner. Naturally she will take pride in seeing her guest fashionably gowned and a credit to her! The day of ugly wearing apparel for motoring is past; and you can put all the money you have to spend in a fetching little bonnet.

What you want most they would care for least

A large, flowing veil of the best quality will last and prove the cheapest in the end. You can get it on better, too, than one that happens to be a little narrower, and nothing is more apt to impress your hostess with the fact that you are not used to automobiling than for you to be constantly trying to adjust your veil. Have it plenty large enough, get it on good and tight before starting.

Your best fur coat will not be harmed in the least if properly protected by one of the over-garments I have already suggested. In very cold or wet weather a big "slicker" will cover you completely and also keep out the wind. It is quickly slipped off when you wish to alight, and thus you have the double advantage of being warmly as well as handsomely dressed.

Wear your best shoes, too. Shabby footgear will utterly ruin the appearance of an otherwise well-attired woman.

After riding with one person or in one car a few times you will probably be able to discover some little need that will give you the opportunity of making a suitable present. It might be a leather-covered pillow to slip in at the small of the back or under the feet on a long, tiresome run; it might be a new road map, to take the place of the one lost the last time you were along; it might be some addition to the tea basket, or, perhaps, just a convenient little corkscrew, but it will be sure to bring you to mind every time it is used. Automobile accessories are such a constant source of expense that your friends will fully appreciate any of these extras.

It does not come amiss, you will find, to take with you even on a short drive some new book or magazine. If your friend has to leave you a moment she will feel freer if she knows that you have something with which to occupy yourself, so you will not be counting the time until her return. In the event of a puncture, after assuring yourself that you can not possibly be of any assistance, just go off out of safe hearing distance and quietly read while repairs are in progress.

Learn the temperament of your friends and do not make the mistake of talking too much. They can, doubtless, keep up their end, and let them set the pace. One quickly wearies of a never-quiet, and a good listener has by far the more admirers.

Ascertain first the amount of space that can be given your baggage

In packing your grip, by the way, be sure to get in all such things as your toilet articles, talcum powder, cold cream, soap, etc., as well as your pocket sewing-case. It is likely to prove embarrassing all around if you have to borrow, and yet you may not be where you can buy what you have forgotten.

To sum it up in a few words, exercise every bit of tact you ever were blessed with, and try to acquire more. Never complain under any circumstances, though you be hungry, tired and cold. You will get over these minor discomforts and there is a chance of more harmonious conditions next time. Rest assured your friends are more put out by any such unpleasantness than you can possibly be, and cheer them by ignoring whatever you can. Express your apprecation of their efforts and let them feel that you have had a good time.

She Just Returned from Boarding School

In honor of the home-coming of the graduating daughter, the governor was persuaded by the fond mamma to invest in an automobile, and when the charming young lady arrived it was concluded to take her for a long ride through Summer woods and, as an incident of the trip, lunch by the wayside, for which purpose utensils were collected and tucked away in a hamper.

The roads were very good, the weather fine, and at noonday, under a blue sky and the friendly shade of a spreading oak tree, the car came to a stop. And when all were alighted, a rather sprawling conversation was interrupted for the time it took the "graduate" to prepare the repast, which she insisted upon doing, all by her loneself, using alcohol lamps, and a variety of contraptions, with the deftness of an elf of the dale.

When all was done and a sweet joyous voice burst upon welcome ears "come on" the happy party reclined upon the greensward and with quip and jest fell upon the viands. Almost too full to utter, the sweet young graduate said, "Yes, I've got the loveliest diploma! It's on sheepskin parchment, with a big gold seal. I learned to cook that dish you are eating in the cooking class, now just guess what it is?"

"It is—er"—the wise old governor cocked his keen old eye—"Is it the diploma, dearie?"

In case of breakdown repress that natural inclination to ask why

Advised Limits of Tolerance

THE LIMITS WITHIN WHICH IT IS DESIRED TO WORK IN THE FINISHING OF PARTS THAT SO RELATE TO EACH OTHER THAT THEY HAVE TO FIT AS JOURNALS AND BEARINGS, OR AS PRESS FITS

LIMITS OF TOLERANCE FOR TAPER FITS, DIMENSIONS IN INCHES.

Diameter of part	Diameter of hole to be less than shaft by — Press fit Inches	Drive fit Inches	Hand fit Inches
1 inch	.005 to .006	.0005 to .0015	.0000 to .001
2 inch	.006 to .007	.001 to .002	.0000 to .001
3 inch	.007 to .008	.0015 to .0025	.0000 to .001
4 inch	.008 to .009	.002 to .003	.0000 to .001
5 inch	.009 to .010	.0025 to .0035	.0000 to .001
6 inch	.010 to .011	.003 to .004	.0000 to .001
7 inch	.011 to .012	.0035 to .0045	.0000 to .001
8 inch	.012 to .013	.004 to .005	.0000 to .001
9 inch	.013 to .014	.0045 to .0055	.0000 to .001
10 inch	.014 to .015	.005 to .006	.0000 to .001
11 inch	.015 to .016	.0055 to .0065	.0000 to .001
12 inch	.016 to .017	.006 to .007	.0000 to .001

For 3-16-inch to 1-inch taper, use table allowance.
For 3-8-inch to 1-inch taper, use table allowance divided by 2.
For 3-4-inch to 1-inch taper, use table allowance divided by 4.
For 1 1-2-inch to 1-inch taper, use table allowance divided by 8.
Male member in all cases to be + 0.0005 inch.

LIMITS OF TOLERANCE FOR TAPER FITS, DIMENSIONS IN MILLIMETERS.

Diameter of part	Diameter of hole to be less than shaft by — Press fit Millimeters	Drive fit Millimeters	Hand fit Millimeters
25	.125 to .150	.0125 to .025	.0025 to .025
50	.150 to .175	.025 to .05	.0025 to .025
75	.175 to .2	.037 to .063	.0025 to .025
100	.2 to .225	.05 to .075	.0025 to .025
125	.225 to .250	.063 to .087	.0025 to .025
150	.250 to .275	.075 to .1	.0025 to .025
175	.275 to .3	.087 to .113	.0025 to .025
200	.3 to .325	.1 to .125	.0025 to 025
225	.325 to .350	.113 to .137	.0025 to .025
250	.350 to .375	.125 to .15	.0025 to .025
275	.375 to .4	.137 to .163	.0025 to .025
300	.4 to .425	.15 to .175	.0025 to .025

LIMITS OF TOLERANCE FOR PARALLEL FITS, IN INCHES.

Diameter of part	Bore of hole greater than diameter of shaft — Close fit Inches	Free fit Inches	Loose fit Inches	Nominal fit Inches
1 inch	.003 to .005	.008 to .011	.023 to .028	0 to .002
2 inch	.004 to .006	.009 to .012	.026 to .031	0 to .00225
3 inch	.005 to .007	.010 to .013	.029 to .034	0 to .0025
4 inch	.006 to .008	.011 to .014	.032 to .037	0 to .00275
5 inch	.007 to .009	.012 to .015	.035 to .040	0 to .003
6 inch	.008 to .010	.013 to .016	.038 to .043	0 to .0035
7 inch	.009 to .011	.014 to .017	.041 to .046	0 to .004
8 inch	.010 to .012	.015 to .018	.044 to .049	0 to .00045
9 inch	.011 to .013	.016 to .019	.047 to .052	0 to .005
10 inch	.012 to .014	.017 to .020	.050 to .055	0 to .0055
11 inch	.013 to .015	.018 to .021	.053 to .058	0 to .006
12 inch	.014 to .016	.019 to .022	.056 to .061	0 to .0065

In all cases, while figures given are for bore of hole greater than diameter of shaft, the bores should be within .0005 inch of standard dimensions given, and the shaft or part to fit in the hole should have the allowance here given below the standard dimension given on drawing.

LIMITS OF TOLERANCE FOR PARALLEL FITS, IN MILLIMETERS.

Diameter of part	Bore of hole greater than diameter of shaft — Close fit Millimeters	Free fit Millimeters	Loose fit Millimeters	Nominal fit Millimeters
25	.075 to .125	.2 to .275	.575 to .7	0 to 050
50	.1 to .15	.225 to .3	.65 to .775	0 to .056
75	.125 to .175	.250 to .325	.725 to .85	0 to 063
100	.150 to .2	.275 to .350	.8 to .925	0 to .069
125	.175 to .225	.3 to .375	.875 to 1.00	0 to .075
150	.2 to .25	.325 to .4	.95 to 1.075	0 to .087
175	.225 to .275	.350 to .425	1.025 to 1.15	0 to .1
200	.250 to .3	.375 to .450	1.1 to 1.225	0 to .113
225	.275 to .325	.4 to .475	1.175 to 1.3	0 to .125
250	.3 to .35	.425 to .5	1.25 to 1.375	0 to .138
275	.325 to .375	.45 to .525	1.325 to 1.45	0 to .15
300	.35 to .4	.475 to .550	1.4 to 1.525	0 to .163

In all cases, while figures given are for bore of hole greater than diameter of shaft, the bore should be within .0125 of standard dimension given, and the shaft or part to fit in the hole should have the allowance here given below the standard dimensions given on drawing.

LIMITS OF TOLERANCE FOR PARALLEL FITS OF MEMBERS, IN INCHES.

Diameter of part	Diameter of shaft — Greater Press fit Inches	Greater Drive fit Inches	Less Hand fit Inches	Less Nominal fit Inches
1 inch	.001 to .002	.0005 to .0015	.001 to .002	0 to .002
2 inch	.002 to .003	.001 to .002	.0015 to .0025	0 to .002
3 inch	.003 to .004	.0015 to .0025	.00175 to .00275	0 to .002
4 inch	.004 to .005	.002 to .003	.002 to .003	0 to .003
5 inch	.005 to .006	.0025 to .0035	.0025 to .0035	0 to .003
6 inch	.006 to .007	.003 to .004	.00275 to .00375	0 to .003
7 inch	.007 to .008	.0035 to .0045	.003 to .004	0 to .004
8 inch	.008 to .009	.004 to .005	.00325 to .00425	0 to .004
9 inch	.009 to .010	.0045 to .0055	.0035 to .0045	0 to .004
10 inch	.010 to .011	.005 to .006	.00375 to .00475	0 to .005
11 inch	.011 to .012	.0055 to .0065	.004 to .005	0 to .005
12 inch	.012 to .013	.006 to .007	.00425 to .00525	0 to .005

In these cases the bore of the hole should be within .0005 inch below the drawing size given, and the shaft or other part should change the amounts of these allowances above or below the diameter for the hole, as the case may be, considering the purpose.

LIMITS OF TOLERANCE IN FITTING BALL BEARINGS INTO IN MILLIMETERS.

Diameter of part	Diameter of shaft — Greater Press fit Millimeters	Greater Drive fit Millimeters	Less Hand fit Millimeters	Less Nominal fit Millimeters
25	.0125 to .05	.0125 to .0375	.025 to .05	0 to .05
50	.05 to .075	.025 to .05	.033 to .058	0 to .05
75	.075 to .1	.0375 to .0625	.042 to .067	0 to .05
100	.1 to .125	.05 to .075	.05 to .075	0 to .075
125	.125 to .15	.0625 to .0875	.058 to .083	0 to .075
150	.15 to .175	.075 to .1	.067 to .092	0 to .075
175	.175 to .2	.0875 to .1125	.075 to .1	0 to .1
200	.2 to .225	.1 to .125	.081 to .106	0 to .1
225	.225 to .25	.1125 to .1375	.087 to .112	0 to .1
250	.25 to .275	.125 to .15	.094 to .119	0 to .125
275	.275 to .3	.1375 to .1625	.1 to .125	0 to .125
300	.3 to .325	.15 to .175	.106 to .131	0 to .125

In these cases the bore of the holes should be within .0125 below the drawing size given, and the shaft or other part should change the amounts of these allowances above or below the diameter for the hole, as the case may be, considering the purpose.

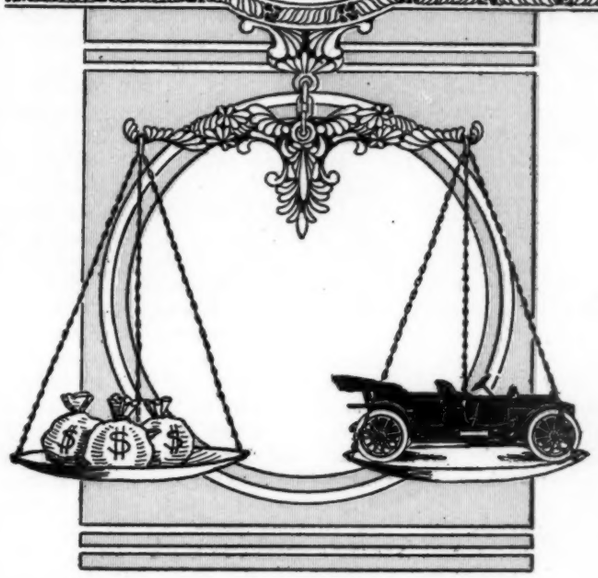
LIMITS OF TOLERANCE IN FITTING BALL BEARINGS INTO HOUSINGS

Approximate dimension of part	Limits of tolerance + or — Inches	Approximate dimension of part	Limits of tolerance + or —
1 inch	.002	25	.05
2 inch	.002	50	.05
3 inch	.002	75	.05
4 inch	.003	100	.075
5 inch	.003	125	.075
6 inch	.003	150	.075
7 inch	.004	175	.1
8 inch	.004	200	.1
9 inch	.004	225	.1
10 inch	.005	250	.125
11 inch	.005	275	.125
12 inch	.005	300	.125

LIMITS OF TOLERANCE IN FITTING BALL BEARINGS TO SHAFTS.

Approximate Diameter of part	Shaft Greater by	Bore for Outer Race Greater by
20	0 to .01	.03 to .06
40	0 to .02	.04 to .07
60	0 to .03	.04 to .07
80	0 to .04	.04 to .07
100	0 to .05	.05 to .08
120	.....	.05 to .08
140	.....	.05 to .08
160	.....	.07 to .1
180	.....	.07 to .1
200	.....	.08 to .11
220	.....	.08 to .11
240	.....	.09 to .12
260	.....	.1 to .13

WHAT THE BUYER WANTS TO KNOW



UTILITY is the underlying principle in the purchase of anything. The man who convinces himself that there is any other foundation for an act which results in the acquisition of a commodity, be it an automobile, a three-ring circus or a ton of coal, fails utterly to carry conviction beyond his own horizon, and it is on this account that the old assertion that automobiles were the mere toys of the rich when they first came out falls to the ground. There is more truth in the statement that the more wealth a man possesses, the greater is his desire in this direction, and in all fairness it must be maintained for those who patronized the industry during its early infancy that they paid enough of money for the cars that they acquired to guarantee to them that they would get the best that the market afforded.

"The best that the market affords" represents the wisest principle of purchase, but it must be remembered that there are a plurality of angles to this principle; in other words, the needs of the occasion must be kept in the mind's eye during the acquisition of the best that the market affords. Of the many purchasers of automobiles, quite a number of them have undoubtedly committed grave errors. Without knowing what they wanted, they visited the haunts of the makers and they landed in the maelstrom of too much talk along lines involving a surfeit of fine selling points that too frequently bore no relation either to the automobile that was being slandered by the salesman, or the wants of the user.

There is no one to blame for the many mistakes that have been made during the purchase of automobiles. The art is new even now, and the men who have been drafted to the service have had to learn in the hard school of experience, but the men who supported the industry by their purchases held no brief for superior knowledge, and to whatever extent ignorance has guided its victims into the land where blunders are "at home," it has been in a good cause. But after all, the same rules that are said to be so good in the guidance of men in other walks of life, are applicable to the automobile industry, and they are being applied more assiduously every day.

It is not believed that the men who devote their lives to the building of automobiles have had time to represent themselves when they talked to the public about their wares, and it is much to be feared that the men who did the talking too frequently harbored the fear that unless they said something they would be misunderstood, although it is difficult to understand how they could say anything worth while out of a bundle of knowledge that at best was but superficial.

It would not be fair to complain about the sincere efforts on the part of those who have had to do the best they could with the tools at their disposal, struggling in a new industry, the direction and scope of which still resists any effort to place boundaries around. But it is not wise to go on telling those who lend their support to the industry about the things that it is hoped will be done in such a way as to lead them to believe that they are the things that are being done. Taking the salesman's story for it on occasions the cars that are being described are really too good; the inquirer would be justified in requesting that some of the wonderful improvements be left out with the hope perchance that the selling price would be favorably affected.

While the subject is up perhaps it may not too rash to refer to the attitude of the average run of automobile papers in the past, and to the fact that they too probably did the best they could under the raw conditions which confronted them at every hand; at all events it was hard to reconcile the products described to the descriptions in many cases, and the strange part of it is that the cars were frequently very much better than the descriptions, although the aims of the writers seemed to be to kill the projects with kindness. There is nothing that falls so flat as a description that does not describe, and it all truth it was a cruel thing to compel some of the men who served out publicity in bygone days to read their own essays in the papers that published them, but they can be sure that they were the entire audience; purchasers of automobiles had no time to read such material.

It is no longer good form to practice these cruelties. If the publicity agent does not know what he is talking about, he finds it difficult to locate his material in a reputable paper, and the company whom he misrepresents sees the wisdom of making a change. The great question at the present time, and the one in fact that taxes the capabilities of those who devote themselves to publication matters, is to tell of the real things that are being done, stating the objects and the methods that are employed in the processes, but it remains to be said that there is still much room for improvement, and there is a positive famine of capable men upon whom reliance could be placed to accurately describe in readable language automobiles and the things that go with them.

This should not be wondered at; there is but one chief engineer in the respective plants, and that it is the plaint of probably every one of them that good men, of the class who can be relied upon to keep pace with the times in the matter of designing, are hard to get. Remembering that it takes just as good a man, in other words, just as clever an engineer to tell how a thing is and should be made, as it does to design and built it, it is simple enough to understand why the literature of the day should be peppered with inaccuracies and too frequently fail of its purpose. The old newspaper idea is too prevalent in the literature of the automobile industry; in other words, when a man is given an assignment on occasions in newspaper work he is told to get the story; but if he cannot do so to get something. The automobile business has been getting something, and the story, under such conditions, remains in the plants where the automobiles are made, probably tucked away safely in the archives of the engineering department, or carried around as stock in trade in the heads of the designers and the builders who have gained a reputation for what they do rather than for what they say.

The Dawn of a New Era in Publication Work

The makers of automobiles, supported by the efforts of parts makers and accessory makers, under the encouragement which has been steady and increasing in volume, as it is represented by the ease with which good automobiles are sold, have advanced on the highway of improvement to the point where to employ superlatives and superficial descriptions, however cleverly put, is to fail utterly to uncover the facts or to reflect the trend of events. The very makers of automobiles who were so touchy even a year or two ago, when their products were described with reasonable accuracy, find themselves losing patience with the writers who slop over and who fail to see that the cars have progressed, but the writers have not.

It is really not flattering for a man with good manufacturing facilities and a staff of skilled men to turn out a poorly contrived automobile, and it is past believing that any one would do so intentionally, but it must be a sore tax on the patience of an intelligent builder of cars if he does manufacture a worthy product, and then have it described in the same language that was used in the discussion of the cars he made several years ago, when, as a matter af fact, a blind man could tell by the feel that the cars of to-day are superior to those of yesterday, and that the automobiles of five years ago are so out of style and of keeping with the progress made that they have all the earmarks of an old hat.

There are two fundamental principles underlying the automobile situation, one of which has to do with the building of good automobiles because they are easier to make, all things considered, and they sell more readily. The other idea is coupled to the attitude of the buyer when he goes in quest of a car. It is up to him to know what kind of a car he wants. If the literature of the day is intended to serve as the conduit by means of which the makers of automobiles are to be afforded the facilities for telling prospective purchasers what the market affords, it cannot be too much to point out that the conduit should be a clean and wholesome channel, and that the stream which passes through it should be undefiled by riffraff. Plainly, then, the technical press is devoted to the examination of real information, the stating of the facts in relation to the building of automobiles, telling how they are made, what they will do, how they must be managed, giving the experiences of those who use them so that their limitations will be as an open book. It is one of the greatest advances of the time that is represented in the insistance on the part of the makers of automobiles that the technical press shall live up to its name and tell the truth about the automobiles that are being made, so that if a citizen wants to buy a runabout at, say, $650, he will by no possible chance gather the impression that he will be encumbered with a touring car at $5,000 instead.

It is a marvelous advantage to adhere to simplicity in making an explanation. As an economic proposition, so much time can be saved by simply stating the facts that the men who are devoted to the sale of automobiles will find themselves in a position to present their wares to a multiplied clientele, and those who go in quest of cars will find what they want and be sure that they get it within a small fraction of the time it formerly took in the discussion of politics, religion, flying-machines and future prospects, as if indeed, these quaint subjects have ought to do with the business in hand.

The Purchaser Must Ultimately Pay for His Foolishness

There is such a thing as paying too much money for a good automobile. The average purchaser does his best to bring about this condition. If it is the desire of a prospective purchaser to buy one automobile, but if he takes the demonstration in 20 automobiles before he selects the one that matches up with his then dazed state of mind, it is more than likely that he will find himself the possessor of that which cannot possibly match up with his needs, and he will have to pay for the 20 demonstrations that were accorded him in the process. It will be a little difficult to reduce the average man in his state of mind to the point where he will be able to appreciate the fact that every demonstration that he takes will be at his cost. One of the most expensive items connected with the sale of automobiles is represented in demonstration. If automobile makers succeed in realizing a dividend on their capital stock, since they collect every cent that goes into their coffers from the buyers of automobiles, it requires no stretch of the imagination in the process of finding out who pays the bill.

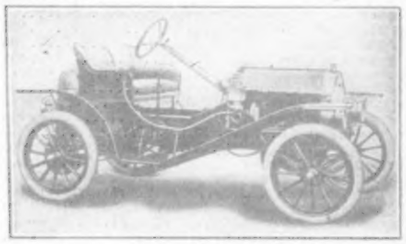
Who but the purchaser should shoulder the expense account if demonstrations have to be given? The cost of making these demonstrations is enormously inflated, due to the unreasonableness of the purchasers of automobiles. Men who would not steal chickens, beat a newsboy out of his just reward, or refrain from attending Sunday-school even once in the 52 possibilities per year will call upon the agent of a maker of automobiles and ask him to place a reckless demonstrator in a car and take Mr. Prospective on a long ride, for no better purpose than to try to break down the structure of the automobile, violating every law on the statute book in relation to the regulation of traffic, believing the while that the cost of this useless effort is to be paid by somebody else.

It is a great joke upon buyers of cars that they have to pay the bill in the long run, but there are very few jokes that serve as the foundation for a dividend, and the builders of automobiles are compelled to devote quite a few of their energies in the satisfaction of the whims of buyers. A display of intelligence in the selection of an automobile is to be recommended, in view of the good results that have been experienced by those who did display intelligence. There are other grounds for believing that it is worth while to be thoughtful and considerate, avoiding all useless and ill-timed efforts, one of which is to accept a demonstration from the representative of the maker of a car if the price of the same is more than the purchaser can afford to pay.

There is another angle to this situation; for instance, it might be better to take the time that is wasted in fruitless demonstrations, devoting it to some paying occupation, and the money earned in this fashion, if added to the amount already in hand, might total up to the purchase price of a better automobile, at least a more pretentious one, thus putting the time to good account and saving the agents of companies the cost of entertaining.

Cars Costing Under $750

THERE are a variety of low-priced automobiles and the great problem is to get purchasers to appreciate their uses and not to assume that they are unpretentious and lacking in some respects,

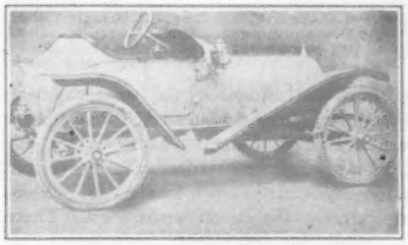


BRUSH, MODEL "E"

Price	$450
Type of body	Runabout
Seats	2
Wheelbase	80
Tread	54½
Type of motor	4-cycle
How cooled	Thermo-syphon
Number of cylinders	1
Method of casting cylinders	Block
Stroke	4x5
Horsepower (A. L. A. M.)	6.4
Ignition	High tension magneto
Type of carbureter	Kingston
Method of lubrication	Circulating
Type of clutch	Multiple disc
Transmission	Planetary
Drive	2 chains
Front tire equipment	28x3
Rear tire equipment	28x3

and that this is the reason why the price is low. But in order to understand the relation of price to what the price affords, it will be desirable to reason for a time to bring out the point to be made with fitting illustrations. It has been said by those who have experience that it costs $5-,000 to build one automobile, and experience also seems to indicate that the quality of this $50,000 automobile is more or less in question, it being, as a rule, a half-baked model of the builder's crude conception. Let us go a little further and by a simple homily bring home to ourselves the truth of the matter; for instance, there are weeds in the average garden that we have to pay annual sums to get rid of, but there was a time when some of these species of weeds were cultivated at enormous cost. The quantity production of weeds evidently had a marked depreciating effect upon their value, and it is this quantity production that is necessary to the success of the automobile, and which, if carried too far, would result in its commercial failure. It is something of a question as to whether or not the intending purchaser can afford to take very much time in attempting to determine as to the ruling problem of the maker. If an engineering staff, under the direction of a board of directors, presided over by a chief executive, are essential to the building of automobiles, it is a little difficult to see how one man situated at a distance from the scene of action can arrive at sound conclusions bearing upon managerial situations. To whatever extent the intending purchaser diverts his thoughts from their proper channel, he runs the risk of being the loser, and it would seem to be a better idea to concentrate upon the one problem in hand, i. e., the purchase of the car.

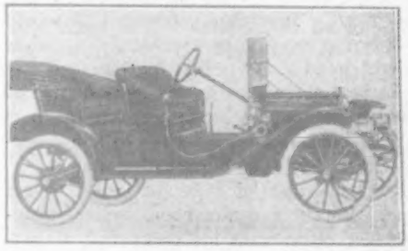
If it may be taken for granted that an automobile may be better for certain classes of work if it is relatively unpretentious, it will also follow that since the price will be relatively low, it is an economical thing to consider. Let us assume for the moment that a garage attached to a country house has thirteen varieties of big touring cars therein and ready for instant service; even so, there will be thirteen varieties of touring car responsibility when, as a matter of fact, the owner of the establishment might feel in the mood to shun responsibility, and with a relatively small and inexpensive runabout he can visit near-by places, inspect his grounds, and in many ways entertain himself, thus getting more out of the little car than he can from the most costly and elegant limousine that automobile engineers have as yet been able to design and build. There are a large number of cars that cost less than $750, doing just this kind of work, and their value, taking them on the whole, is much appreciated.



HUPMOBILE ROADSTER

Price	$850
Type of body	Torpedo
Seats	2
Wheelbase	86
Tread	56
Type of motor	4-cycle
How cooled	Thermo-syphon
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	3¼x3⅜
Horsepower (A. L. A. M.)	16.9
Ignition	High tension magneto
Type of carbureter	Breeze
Method of lubrication	Oil fed with fuel
Type of clutch	10 plate disc
Transmission	2 speed selective
Drive	Shaft
Front tire equipment	30x3
Rear tire equipment	30x3

Some of the makers of the more pretentious types of automobiles, desiring to take advantage of the good facilities that augur well for them, actually purchase and use the smaller types of cars as made by their neighbors in and about the plants, and they realize a profit by so doing, since the cost of messenger service ceases to be a serious factor, and the quick delivery of goods is not offset by the relatively heavy charges which must attend the use of a larger car.



FLANDERS, "20"

Price	$700
Type of body	Roadster
Seats	2 and 4
Wheelbase	100
Tread	56, also 60
Type of motor	4-cycle
How cooled	Centrifugal water pump
Number of cylinders	4
Method of casting cylinders	Block
Bore and stroke	3¾x3⅝
Horsepower (A. L. A. M.)	22.5
Ignition	High-tension magneto
Type of carbureter	Flanders
Method of lubrication	Vacuum
Type of clutch	Cone
Transmission	2-speed selective
Drive	Shaft
Front tire equipment	32x3
Rear tire equipment	32x3

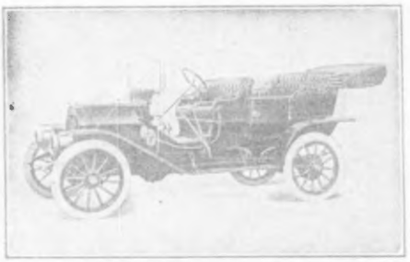
It will be unnecessary to enlarge upon the idea that doctors everywhere find it to their advantage to use automobiles; moreover, they belong to the class of men who are accustomed to thinking seriously for themselves, and they decide as to their needs as a preliminary effort attending the selection of a suitable automobile.

There are not enough of contractors using low-priced cars in their work; too many of them are holding off until they can afford to buy the more expensive types of automobiles. This is probably a serious mistake with some of them. No matter how much money a man may have, he is not justified in expending it in the purchase of a high-priced automobile, if a relatively small car will be more useful to him, and it is probably true that the average contractor can get more utility out of a well-made runabout or roadster type of car than he will be able to realize from its big brother, the touring car.

It would seem to be an unnecessary task to urge men who have a real need

for cars to buy them, but there are a great number of people whose habits and the work of their profession prevent them from buying the span of their shortened life, and who do not seem to live long enough to be able to learn that fresh air and pleasant diversion are the underlying principles of happiness, longevity and prosperity. The man who is being paid $10 per week for inefficient services in a cooped up office would receive $15 per week were he worth it, and if he could so animate himself that his employer would be given a favorable impression, it would not be too much to expect that the employer might build a new office for him and pay him $100 per week. It is a mere matter of determination and persistence on the part of the man he does not have to know anything to begin with excepting that he is there, and that he does not intend to get out. But how can a poor, supine, insignificant clerk, with his lungs full of carbonic acid expect to generate a sufficiency of force to attract the notice of anyone; with his congested lungs and his befogged brain and his soul perishing for want of light, he harbors the impression that his companions and his employer are in a conspiracy to hold him in subjection.

Within the first ten days after the purchase of an unpretentious automobile, attending its proper use, the poor mummy of the counting house would pluck up nerve enough to earn $20 per week instead of $10 and he would get it; at the end of a month he would have 50 per cent added to his stipend, and at the end of a year he would have charge of an important division of his company's work. The little automobile, despite the fact that it might prove as a hardship to make the initial purchase,



E-M-F, MODEL "30"

Price	$1,000
Type of body	Touring
Seats	5
Wheelbase	106
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	4x5½
Horsepower (A. L. A. M.)	25.6
Ignition	High tension magneto
Type of Carbureter	E-M-F
Method of lubrication	Vacuum
Type of clutch	Cone
Transmission	3 speed selective
Drive	Shaft
Front tire equipment	32x3½
Rear tire equipment	32x3½

would be the stepping stone to greater things, and the employer of the man would find himself the possessor of the services of well directed intelligence at no greater cost than a little fresh air, and a glimpse of Nature under the most agreeable conditions.

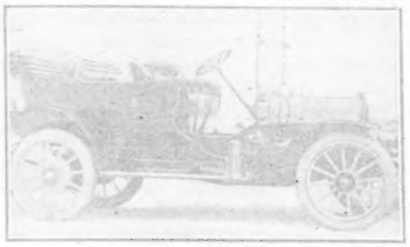
It is not necessary to confine illustration to the poor clerk of the counting house. Take the business man who, perchance, lives in the suburbs and whose time is so taken in the pursuit of the nimble dollar that he arrives home late for dinner, and too tired for other pursuits. A pretentious automobile, under such conditions, would affront the intelligence of the man; he would be in no shape to assume a real responsibility, but a relatively inexpensive and simply contrived automobile, one that he could roll out of a garage, start without any trouble at all, and by its use take even

ELMORE, MODEL "25"

Price	$1,200
Type of body	Roadster
Seats	2
Wheelbase	108
Tread	56
Type of motor	2-cycle
How cooled	Thermo-syphon
Number of cylinders	4
Method of casting cylinders	Single
Bore and stroke	4x3½
Horsepower (A. L. A. M.)	25.6
Ignition	High-tension magneto
Type of carbureter	Elmore
Method of lubrication	Mechanical oiler
Type of clutch	Multiple disc
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	32x3½
Rear tire equipment	32x3½

a short half hour in the open, and he would find himself, instead of coming home late and tired, doing his work of the day with such increased speed that he would arrive home in time for dinner, and anxious to continue a pleasant association. There is more to this story for him; his business would be more profitable, his judgment would be better, and he would find himself the center of a magic circle, with many and pleasant friends, and while he might have difficulty in explaining the situation to his own satisfaction, the fact remains that it is a mere matter of oxygen, pleasant surroundings and something to divert the mind—the little automobile that gives pleasure without demanding responsibility.

Don't forget to take the jack along.



REO, MODEL "R"

Price	$1,250
Type of body	Touring
Seats	5
Wheelbase	108
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	4x4½
Horsepower (A. L. A. M.)	25.6
Ignition	High-tension magneto
Type of carbureter	Stromberg
Method of lubrication	Circulating
Type of clutch	Multiple disc
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	34x3½
Rear tire equipment	34x3½

Don't high-gear it to a mud hole in the road; you cannot be sure of the depth of the hole; go slow; use the low gear; that is what it is for.

Don't race down every hill you come to just to get up the impetus necessary to make the facing grade on high gear; what is the matter with using a lower gear on the hill?

Don't race off to the sales agency and talk about being stuck after you buy a car and it fails to come up to your final expectation. Don't expect anything. Decide on what you want first, then buy the car.

Don't stand in your own light; cheap lubricating oil is the most efficacious means for a high cost of maintenance.

Don't labor under the impression that quantity will suffice for quality when it comes to lubricating oil; make it quality first, last, and all the time.

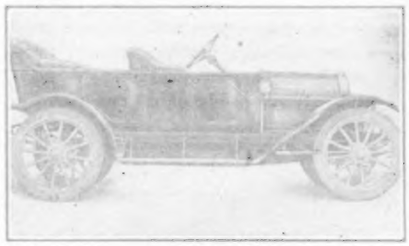
Don't let water accumulate in the fuel system. Drain out all the liquid, say, once a week and start with a new gasoline supply.

Don't demand the last ounce of power from your motor; it will last longer if it is worked under average conditions.

Don't think that a 25-cent pump will do good work; a large tire pump is a paying investment.

Don't come off the road with your car all splashed up with mud and let it remain on until it forms a dry crust. It will come off, of course, but the varnish will adhere to the mud instead of the car.

Don't tolerate short measure; you are entitled to every gallon of gasoline that you have to pay for; show the rascal up.



OVERLAND, MODEL "52"

Price	$1,250
Type of body	Touring
Seats	5
Wheelbase	110
Tread	56
Type of motor	4-cycle
How cooled	Thermo-syphon
Number of cylinders	4
Method of casting cylinders	Single
Bore and stroke	4x4½
Horsepower (A. L. A. M.)	25.6
Ignition	High-tension magneto
Type of carbureter	Overland
Method of lubrication	Mechanical oiler
Type of clutch	Cone
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	34x3½
Rear tire equipment	34x3½

Don't start rubbing down the varnished surfaces of the car before the sand is all removed; grindstones are made of sand; you might just as well use a grindstone.

Don't persuade yourself that a car is making all the noise that it can when the demonstrator is nursing it along the boulevard at a low speed; try it out on high speed; give it a little cobble stone going; if it rattles like a saw mill purchase it as one if you have very little wood to saw.

Don't fail to test the car out on the several gears; it may not be silent on any of the gears excepting "direct."

Don't think that a second-hand car is good just because it cost a lot of money in the first place.

Don't wound a sensitive nature by coarse treatment; highly finished surfaces of bodies are most sensitive; like human characters of the sensitive class, they are easily wounded.

Don't buy a seven-passenger car before your family expands sufficiently to take up the reserved seats in the tonneau; your neighbors are mighty apt to fill the vacancies.

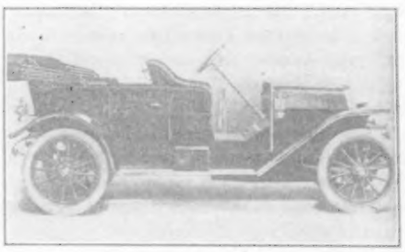
Don't tread the car tracks if it can be avoided; the rails are usually frayed out in places, and the knife-edges are likely to cut the tread on the tire casing.

Don't reach the conclusion that the carbureter is large enough for the intended purpose even if it does carburet at both high and low speeds. The carbureter might fail when the car is half-way up a long steep hill.

Don't persuade yourself to believe that you can see so many things that you have no use for and then pick out the one idea that conforms with your needs.

Don't suppose that the varnish will not crack when it gets old; everything does, even the complexion.

Don't assume that the lubricating oil can be carried in your hand; let the maker of the car provide a place for it.



COURIER, STODDARD "20-4"

Price	$1,250
Type of body	Touring
Seats	5
Wheelbase	112
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Block
Bore and stroke	4x4½
Horsepower (A. L. A. M.)	25.6
Ignition	High-tension magneto
Type of carbureter	Stromberg
Method of lubrication	Circulating
Type of clutch	Cone
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	32x3½
Rear tire equipment	32x3½

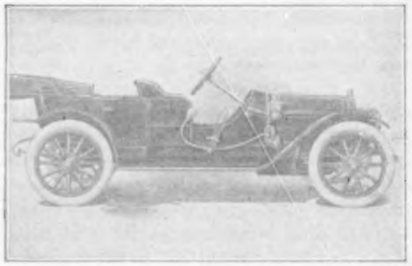
Don't assume that a car that looks bad is good. True, beauty is as beauty does; equally true, beauty is an outward sign of an orderly interior.

Don't drive friends' cars unless it is necessary. If anything goes wrong you will surely be blamed.

Cars Costing Between $750 and $1,250

GLANCING at the list of automobiles ranging within the price limits as stated lends the impression that there is ample opportunity for the man who wishes to operate over a somewhat extended radius, and who may find the restrictions of the relatively low priced car unnecessary for him, rather with the expectation that he will profit by the increased investment. The principle involved in the investing of money is such that it is the truth to say the greater the investment the better, if safety resides therein and a dividend is assured. No investor of acumen ever wastes time talking about a reduction of the investment; the real question is, how much is it possible to invest with profit and with safety? In this light, there is no violation of logic when the inference is made that a car costing $750 or less may have limitations that the man who can afford to pay $1,250 cannot consistently accept. In the purchase of an automobile, while it is necessary to struggle with the problem of raising the money to pay the first cost, it remains to remember that there is a cost of maintenance and that it will be increased if a relatively small car is overloaded, or if a relatively large car is overspeeded. Having selected for a given service an automobile of the desired capacity, the question of overloading may be dispensed with, and the prudent use of the car is all that remains if the user intends to limit the maintenance charges. It is scarcely to be expected that a car costing $750 or less can be economically equipped with a large and heavy body, with seating space for several persons, but by increasing the purchase price to a point not far from $1,000 the body may at once be accepted on a more extended basis, so that an owner and his family may enjoy the benefits to be derived from conservative automobiling, the only danger being that if his family is not large enough to fill the vacancies his neighbor's family generally is.

In the purchase of a car within the range of prices given, some judgment should be used, taking into account the character of

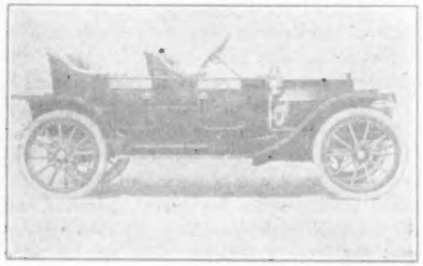


HUDSON, MODEL "33"

Price	$1,300
Type of body	Toy tonneau
Seats	4
Wheelbase	114
Tread	48
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Block
Bore and stroke	4x4½
Horsepower (A. L. A. M.)	25.6
Ignition	High-tension magneto
Type of carbureter	Stromberg
Method of lubrication	Circulating
Type of clutch	Multi-disc
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	34x3½
Rear tire equipment	34x3½

the countryside where the car will have to do service, remembering that the gear ratio may be low if the roads are flat and improved, but that the gear ratio must be increased if the roads are unimproved or if grades are met with some of them over steep. But if the gear ratio is not to be adjusted to suit the characteristics of the locality wherein the automobile is to do service, it remains to select a type of car that will be provided with ample motive power, a substantial chassis and a body that should afford comfort and convenience with a minimum of weight.

In picking out a small car the necessity for a pretentious line of accessories is reduced to its lowest ebb, but in the selection of the car as here referred to it is more important that the tools and equipment are brought up to the level of a more vigorous



EVERITT, MODEL "30"

Price	$1,350
Type of body	F. D. close-coupled
Seats	4
Wheelbase	110 in.
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Block
Bore and stroke	4x4¾
Horsepower (A. L. A. M.)	24
Ignition	High-tension magneto
Type of carbureter	Float-feed
Method of lubrication	Splash
Type of clutch	Cone
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	34x3½
Rear tire equipment	34x3½

and businesslike proposition, remembering that good lighting facilities represent the best insurance policy and that the deft use of a well-made tool on the road at a cost of perhaps a dollar or less, is the medicine that will cure an ailment which, if allowed to run its course, might end in the expenditure of $100 or more, if not in the termination of the sweet-running qualities of the car.

It remains for the salesman of the respective makes of automobiles to convince users of the reasons why some one car may be better than another for a given user, thus making it unnecessary to discuss such detailed problems here. But it can be said that the user should go about the business of purchasing an automobile of the type that can be had within the price named, with the full understanding that he is not getting or likely to get the ponderous touring car; moreover, it might be fitting for him to reach the conclusion that his wants fall below the platform on which the larger car stands.

Don't, just because the price sounds low, purchase an automobile that will not run; are you not aware that old iron is worth about one cent per pound?

Don't think that the steering gear is everlasting merely because it is housed in; look over it, flush it out, put in a new supply of good lubricant; eliminate the lost motion.

Don't fool with the carbureter and after you put it out of joint assume that it is no good; the chances are that it is as bad as you make it; the equal chances are that any other carbureter will be in the same fix after you get through tinkering with it.

Don't catch the enthusiasm of the fellow who has an eye on the yellow backs that persist in peeping over the gunwale of your vest pocket—why not have something to say about it; you are at least entitled to an opinion.

Don't neglect the air valves of the tires. The "sneaking" leak that follows neglect of this character is at great cost. Tires that are not kept properly inflated soon give out.

Don't fail to look twice at the clutch of the car if the same is "fierce." This may be a sign that the clutch is tightened up too much, just for the occasion—it might not hold in regular service.

Don't be satisfied with leaking valves; the leak may not be the sign of serious trouble; if the demonstrator says the valves can be ground in to make them tight, let him show you—the real point is, can they?

Don't run the motor on a retarded spark; it is damaging to the motor; excess heat is the first manifestation; leaky valves follow; weak performance is the further expectation.

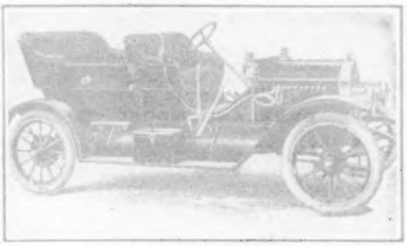
Don't feed gasoline too fast; carbon accumulations will then be deferred, if, indeed, they ever appear.

Don't expect gasoline to feed through a pipe that is plugged up with solder—it is a form of trouble that is too common.

Don't suppose that old age is at the bottom of all the cracking that is to be observed; some cars are so abused that the varnish is not all that cracks.

Don't imagine that color is so fast that it will not fade out if the automobile is stored in a dark room. To preserve the nice appearance of a car it is necessary to store it in a room that is well lighted.

Don't become confused if it is said that the car is almost new and has not gone 1,000 miles—a precipice is not 1,000 miles down—but the going is such that the automobile that negotiates it will have a couple of broken ribs.

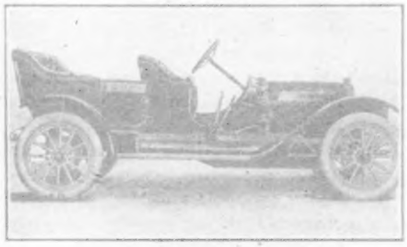


LAMBERT, MODEL "88"

Price	$1,350
Type of body	Touring
Seats	5
Wheelbase	112
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Block
Bore and stroke	4⅛x4½
Horsepower (A. L. A. M.)	27.25
Ignition	High-tension magneto
Type of carbureter	Optional
Method of lubrication	Circulating
Type of clutch	
Transmission	Friction
Drive	Chain
Front tire equipment	32x3½
Rear tire equipment	32x3½

Don't try out your horse trading skill; what's the use of getting stuck?

Don't listen to the wiles of the man who says the car is almost new when the finish on the body shows that it has gone through the revolutionary war.



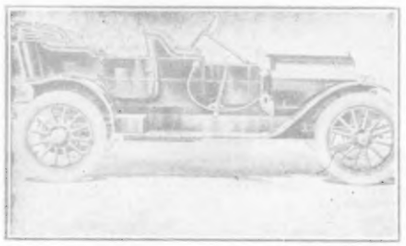
SCHACHT, MODEL "AA"

Price	$1,385
Type of body	Touring
Seats	7
Wheelbase	120
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal water pump
Number of cylinders	4
Method of casting cylinders	Block
Bore and stroke	4¼x5
Horsepower (A. L. A. M.)	28.9
Ignition	High-tension magneto
Type of carbureter	Float-feed
Method of lubrication	Splash
Type of clutch	Cone
Transmission	Three-speed selective
Drive	Shaft
Front tire equipment	34x3½
Rear tire equipment	34x3½

Don't go too far in any one day; there is another day coming.

Don't usurp the position of designer of the automobile that attracts your notice; buy a car that has been designed.

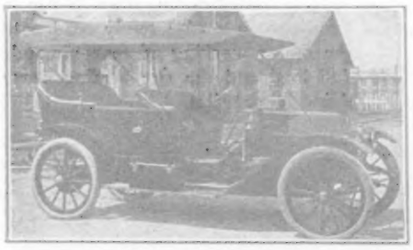
Don't imagine that sand in the housing of the ball-bearings will have any different effect than the same sand would have were it placed in your eye instead; it makes the balls blink.



MITCHELL, MODEL "T"

Price	$1,500
Type of body	Touring
Seats	5
Wheelbase	115
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	4¼x5
Horsepower (A. L. A. M.)	28.9
Ignition	High-tension magneto
Type of carbureter	Halley
Method of lubrication	Circulation
Type of clutch	Cone
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	34x4
Rear tire equipment	34x4

Don't expect good service from ball-bearings if they are placed in a gear-box and the chips from the gears are allowed to mingle with the balls; the way to keep out of the trouble that will follow is to keep the gear-box cleaned out.



HALLADAY, MODEL "J"

Price	$1,500
Type of body	Touring
Seats	5
Wheelbase	110
Tread	56
Type of motor	4-cycle
How cooled	Gear-driven pump
Number of cylinders	4
Method of casting cylinders	Single
Bore and stroke	4x4
Horsepower (A. L. A. M.)	25.6
Ignition	High-tension
Type of carbureter	Float-feed
Method of lubrication	Circulating
Type of clutch	Disc
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	36x3½
Rear tire equipment	36x3½

Don't allow soap and dirt to accumulate over the surfaces of bodies unless it is desired to change them to a mottled appearance.

Don't decide as to the general ability of an automobile without observing its performance first on a level and then in hill-climbing work. If the car will travel fast on a level hard road and in addition to this quality has good hill-climbing ability, it is a sign of power and harmony.

Don't measure the ability of an automobile based upon its high gear performance on a grade; it may be fitted out with a low gear ratio.

Don't drive at night if the lighting equipment on your car is out of order.

Don't overlook the characteristics of ball bearings; they are made of hard dense steel in order to induce a high polish; it is this high polish that renders them fit; acid in the grease will etch the surfaces, thus destroying the high polish, hence ruining the bearings.

Don't think that balls made of inferior material will take a high polish; it may look high to the naked eye, but a microscope will disclose the fallacy.

Don't allow yourself to be persuaded that a screen or a chamois skin will abort water trouble; they may be the cause of it.

Don't imagine that the carburetion is perfect just because there is no frost on the intake manifold; poor gasoline may be in use. If so, it will not evaporate until it contacts with the heated cylinder walls, and in this fact may lie the reason for the absence of frost on the surfaces of the intake manifold, and carbon trouble with the motor.

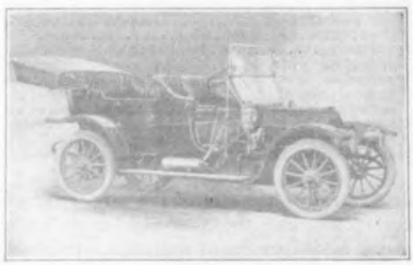
Don't understand that it is desirable to have a frost accumulation on the surface of the intake manifold; far from it, but heat must be supplied to the liquid gasoline in order to vaporize it; this heat should be supplied to the same before it enters the cylinders.

Don't believe all you hear about homes being mortgaged to buy automobiles; the fable tellers of that vintage are crying "sour grapes."

Don't let the repairman put a boy on a man's job; he may do more damage than he is worth; it would be better to pension him off and have done with it.

Don't fail to examine the rear axle and note if the bob-stays are held firmly in the saddles provided for them. Sometimes the stays jump out of the saddles and unless they are promptly replaced the axles will sag due to lack of support.

Don't imagine that a noise is too insignificant to pay attention to; it means that there is something the matter; have it fixed.



KISSEL KAR, MODEL "LD-11"

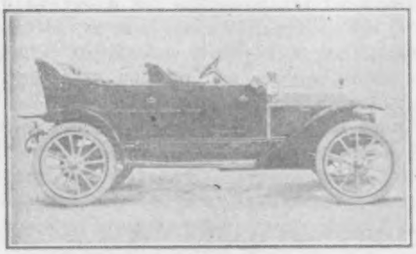
Price	$1,500
Type of body	Touring
Seats	5
Wheelbase	116
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	4¼x4¼
Horsepower (A. L. A. M.)	28.9
Ignition	High-tension magneto
Type of carbureter	Stromberg
Method of lubrication	Circulating
Type of clutch	Cone
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	34x4
Rear tire equipment	34x4

Don't grow weeds in your back yard and an account at a garage for car storage at the same time; put up a little garage of your own—the cost is but a trifle.

Don't run your car week after week without cleaning out the gasoline tank and piping, even down to the carbureter; water accumulates and leads to trouble on the road.

Many Choices Fall Within $1,800

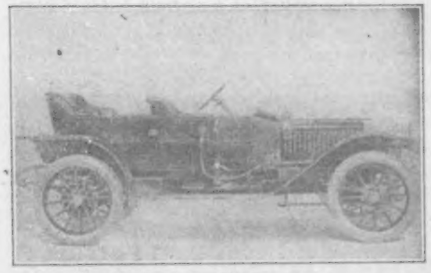
DESPITE the fact that the unsophisticated are the ones who believe in the coming of the extremely well made car "as large as you please," at a very low price, it remains to observe that the user of discrimination can buy a large number of models at prices which range within $1,200 and $1,800. To some extent these prices reflect a greater degree of luxuriousness of the body work; in other cases refinements and innovations of the machinery influence the selling price, and in a



MOON, MODEL "30"

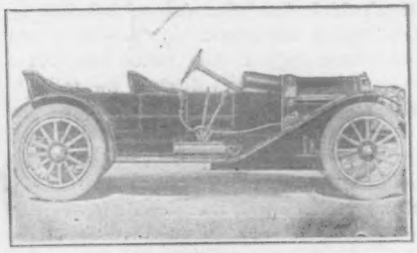
Price	$1,500
Type of body	Touring
Seats	5
Wheelbase	114
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	4¼x5
Horsepower (A. L. A. M.)	28.9
Ignition	High-tension magneto
Type of carbureter	Schebler
Method of lubrication	Circulating
Type of clutch	Multiple-disc
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	34x3½
Rear tire equipment	34x3½

great measure the size of the car, power of the motor, and the general plan is on a fitting basis in view of the price. It is not necessary to marvel if a pretentious body effect is the selling price of an automobile. For years before the coming of the automobile coach-work proved to be expensive, and it is regular practice at the present time to pay several thousand dollars for a body alone. The amount of labor that can be put into the "finish" of an automobile or any other type of vehicle is almost appalling, and there are times when the sense of judgment of men who are trained to the mechanical way of thinking look askance at a body that costs as much as the chassis. It is not believed that the purchaser of an automobile of the type that can be had inside of $1,800 can afford to indulge his artistic vagaries, due to the fact that service is not to be expected from a car unless the machinery is good, and while the subject is up it will be ripe to say that the small cars as previously referred to are conspicuous for their good machinery and for the ingenuity displayed in keeping up the finished appearance without spending much, if any, money upon body work. It is this principle which should obtain to a marked degree in cars costing under $1,250, and even in the automobiles ranging in price between $1,250 and $1,800 there is a marked need for economizing in the cost of the body work in order that the machinery will be as good as possible and capable of sustaining under the increased torsional effort of a more vigorous power plant than that which obtains in the average of the cars of the lower classifications.



MAXWELL, MODEL "G A"

Price	$1,600
Type of body	Touring
Seats	4
Wheelbase	110
Tread	56
Type of motor	4-cycle
How cooled	Thermo-syphon
Number of cylinders	4
Method of casting cylinders	Single
Bore and stroke	4¼x4¼
Horsepower (A. L. A. M.)	28.9
Ignition	High-tension magneto
Type of carbureter	Maxwell
Method of lubrication	Circulating
Type of clutch	Multiple-disc
Transmission	3-speed progressive
Drive	Shaft
Front tire equipment	34x4
Rear tire equipment	34x4



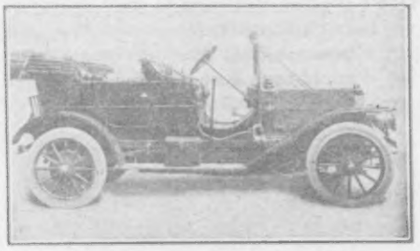
COLE, MODEL "30-O"

Price	$1,600
Type of body	Fore-door touring
Seats	4
Wheelbase	118
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal water pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	4¼x4½
Horsepower (A. L. A. M.)	28.9
Ignition	High-tension magneto
Type of carbureter	Schebler
Method of lubrication	Splash
Type of clutch	Cone
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	34x4
Rear tire equipment	34x4

It is reasonable to expect that the cars in this classification will have more substantial bodies and a higher degree of finish than the standard of work as it is represented in the step below, but the intending purchaser is confined to relatively narrow limits, and as a general proposition the more style he goes in for the less car will he have for his money.

Don't be blinded by a lot of junk accessories—what you need is an automobile that will run, and in which some of the original sweet running qualities may still be discovered.

Don't experiment with lubricating oil; if the brand you are using proves to be efficacious it is your good friend—stick to your friends.



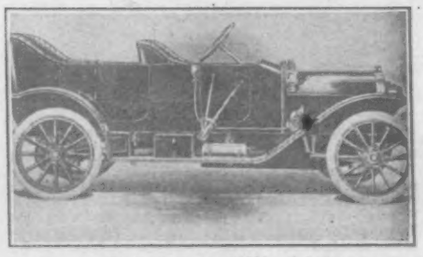
CARTERCAR, MODEL "L"

Price	$1,600
Type of body	Touring
Seats	5
Wheelbase	110
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	4¼x4½
Horsepower (A. L. A. M.)	28.9
Ignition	High-tension magneto
Type of carbureter	Schebler
Method of lubrication	Circulating
Type of clutch	
Transmission	Friction
Drive	2 chains
Front tire equipment	34x4
Rear tire equipment	34x4

Don't forget the more the car costs in the first place, the greater will be the depreciation cost in the long run; if the depreciation is 10 per cent., for illustration, this percentage of $5,000 is $600, and a like percentage of $1,000 is but $100.

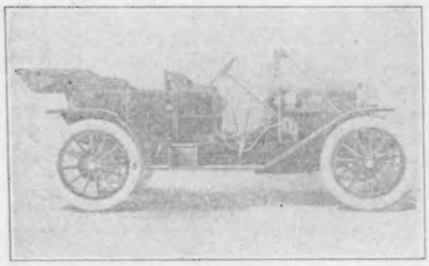
Don't forget that it is the polish on the balls of a ball-bearing that is of the greatest value from the point of view of long life and efficient service.

Don't forget that the ability of a radiator and the cooling system in general will best be brought out when a car is traveling on a long sandy road with the motor working at approximately full load and the sun beating down doing its prettiest.



McINTYRE, MODEL "M-5"

Price	$1,650
Type of body	Touring
Seats	5
Wheelbase	125
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Single
Bore and stroke	4½x5¼
Horsepower (A. L. A. M.)	32.4
Ignition	High-tension magneto
Type of carbureter	Excelsior
Method of lubrication	Circulating
Type of clutch	Cone
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	36x3½
Rear tire equipment	36x3½



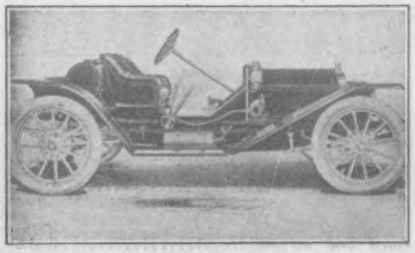
MOLINE, MODEL "M-35"

Price	$1,650
Type of body	Touring
Seats	5
Wheelbase	112
Tread	56
Type of motor	4-cycle
How cooled	Thermo-syphon
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	4x6
Horsepower (A. L. A. M.)	25.6
Ignition	High-tension magneto
Type of carbureter	Schebler
Method of lubrication	Mechanical oiler
Type of clutch	Cone
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	36x3½
Rear tire equipment	36x3½

Don't overlook the fact that the depreciation of an automobile will be greater if the power plant is designed for high speed than will be true if the power available is barely sufficient to propel the car at an ordinary speed—the difference is very noticeable.

Don't allow yourself to get used to the idea that the compression of the motor is all right just because it cranks hard. A supply of heavy lubricating oil, put in on purpose, would produce this effect.

Don't have a vulcanizer and not use it; tire-life depends upon care; the latter without a vulcanizer is impossible.



BLACK CROW, MODEL "16"

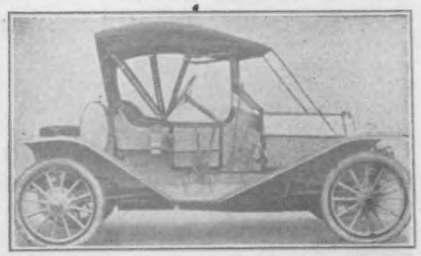
Price	$1,650
Type of body	Runabout
Seats	2
Wheelbase	120
Tread	56
Type of motor	4-cycle
How cooled	Thermo-syphon
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	4⅝x5
Horsepower (A. L. A. M.)	30.625
Ignition	High-tension magneto
Type of carbureter	Schebler
Method of lubrication	Constant level splash
Type of clutch	Multiple-disc
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	34x3½
Rear tire equipment	34x3½

Don't expect the automobile to be in serviceable condition if it is old and is in need of an overhauling; it is cheaper in the long run to give it the periodical overhauling that will offset depreciation.

Don't be surprised if the spare tire that you left exposed to sun and weather for six months proves to be short-lived; tires depreciate when exposed to light as well as to weather; why not purchase a cover and use it?

Don't imagine that an empty tonneau costs little or nothing; it is difficult to keep the rear wheels on the road when the car thrashes along at high speed under the influence of a heavy body that is not properly weighted down.

Don't fail to place an adequate supply of lubricant in the case with the inner tube in putting a tire on. What is lubricant for tubes? Talcum!



STAVER CHICAGO, MODEL "35 RR"

Price	$1,650
Type of body	Road roadster
Seats	2
Wheelbase	117
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Block
Bore and stroke	4½x5
Horsepower (A. L. A. M.)	30.6
Ignition	High-tension magneto
Type of carbureter	Halladay
Method of lubrication	Splash
Type of clutch	Multiple-disc
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	35x4
Rear tire equipment	35x4

Don't have lubricating oil in such quantity that you can afford to let it drip on the garage floor; it ruins tires. If, through some inadvertence, oil gets on the floor, clean it up before the car is rolled in; one daub of lubricating oil on a tire and it will depreciate perhaps 50 per cent.

Don't wait for the ball-bearings in the hubs of the road wheels to go to pieces before taking the hub-caps off and determining as to the prevailing condition. If the bearings are flushed out once a month and new grease is applied the cost of maintenance will be relatively very low.

Don't forget that flexure is the bane of tires—anything that will eliminate flexure is worth its weight in gold.

KLINEKAR, MODEL "4-30"

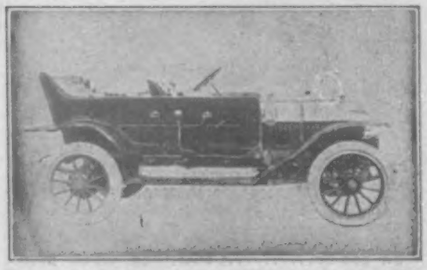
Price	$1,675
Type of body	Touring
Seats	5
Wheelbase	110
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Separate
Bore and stroke	4x4½
Horsepower (A. L. A. M.)	25.6
Ignition	High-tension magneto
Type of carbureter	Float-feed
Method of lubrication	Circulating
Type of clutch	Cone
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	34x3½
Rear tire equipment	34x3½

Don't fill the radiator to overflow. When the water heats up it swells and a little "expansion" room is desirable.

Don't scoop dirty water from a pool to use in the radiator. Scale, when it forms, is extremely difficult to remove.

Don't get used to thinking that fabric as it is used in the making of tires is some supernatural material that will stand all sorts of abuse—it costs money and plenty of it to indulge in such a dream.

Don't look in the eye of the man that is telling you how good a second-hand car is; look in the eye of the car and see if it has a cast in it.

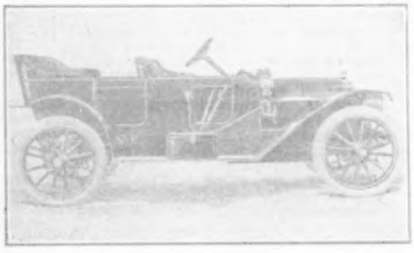


JACKSON, MODEL "41"

Price	$1,700
Type of body	Touring
Seats	5
Wheelbase	110
Tread	56
Type of motor	4-cycle
How cooled	Thermo-syphon
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	4½x4½
Horsepower (A. L. A. M.)	32.4
Ignition	High-tension magneto
Type of carbureter	Schebler
Method of lubrication	Flywheel circulating
Type of clutch	Multiple-disc
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	34x4
Rear tire equipment	34x4

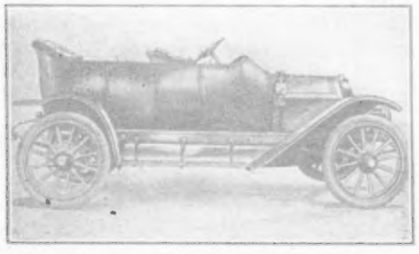
Widest Selection Within $3,000

AN examination of the automobiles that fall within the range of prices represented by $1,800 to $3,000, inclusive, shows an increase over the number of choices available in the next step below.



AUBURN, MODEL "Y"

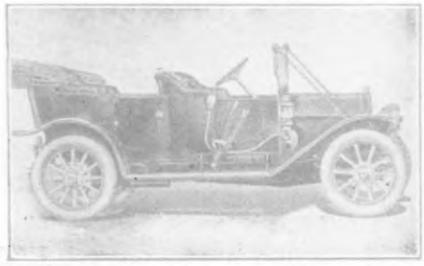
Price	$1,700
Type of body	Touring
Seats	5
Wheelbase	120
Tread	56
Type of motor	4-cycle
How cooled	Gear-driven pump
Number of cylinders	4
Method of casting cylinders	Single
Bore and stroke	4½x5
Horsepower (A. L. A. M.)	32.4
Ignition	High-tension magneto
Type of carbureter	Float-feed
Method of lubrication	Splash
Type of clutch	Cone
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	36x3½
Rear tire equipment	36x3½



GREAT WESTERN, MODEL "40"

Price	$1,750
Type of body	Torpedo
Seats	4
Wheelbase	114
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal water pump
Number of cylinders	4
Method of casting cylinders	Single
Bore and stroke	4¼x5
Horsepower (A. L. A. M.)	28.9
Ignition	High tension
Type of carbureter	Float-feed
Method of lubrication	Automatic
Type of clutch	Cone
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	35x4
Rear tire equipment	35x4

Quite a number of the cars in this classification range in prices between $2,000 and $2,500, and they represent types of automobiles of peculiar merit for general utility purposes. It would be impossible to make a cursory examination of these cars and thereafter point out in a definite way just what they do represent. That the body work is more pretentious is, of course, true in the main, and in many of the examples the wheelbase is long, the power plants have motors of greater displacement and the service expectation is on an ambitious basis. From the purchaser's point of view, the difficulty in making a selection is increased in some respects, and decreased in other ways. These points are independent of the individual qualifications of the respective makes of automobiles in this, or for that matter any of the divisions, it being the case that increasing the power and the speed increases the ratio of depreciation



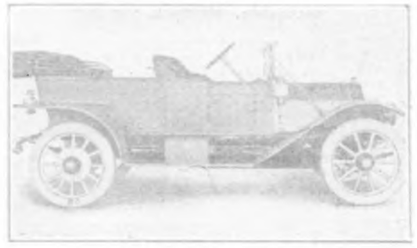
CADILLAC, MODEL "30"

Price	$1,800
Type of body	Fore-door touring
Seats	5
Wheelbase	116
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Single
Bore and stroke	4½x4½
Horsepower (A. L. A. M.)	32.4
Ignition	High-tension magneto
Type of carbureter	Schebler
Method of lubrication	Mechanical oiler
Type of clutch	Cone
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	34x4
Rear tire equipment	34x4

from an academic point of view, and unless the makers of these relatively high priced automobiles adhere to a settled plan of quality it cannot be otherwise than to react against them, resulting in an undue measure of depreciation and general dissatisfaction among their supporters. The very fact, however, that these cars are in the preponderance, in point of numbers of the makers, may be taken as evidence of the stability of the product, thus leaving it to point out that if there are dissatisfied users of automobiles falling within this range of prices, they probably belong to the class of the men who make it a practice of acquiring that for which they have to pay the penalty.

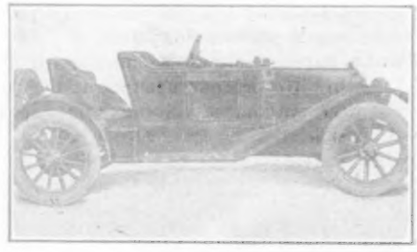
Don't think that it is possible to blow up tires sufficiently to compensate for the lack of size that should be used on your car. If the tires are not big enough for the work they are placed to do it is not possible to inflate them sufficiently to prevent excess flexure.

Don't leave a car standing in the sun when it is possible to put it in the shade.



CASE, MODEL "K"

Price	$1,950
Type of body	Torpedo
Seats	4
Wheelbase	
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal water pump
Number of cylinders	4
Method of casing cylinders	Pairs
Bore and stroke	4¼x5
Horsepower (A. L. A. M.)	28.9
Ignition	Coil
Type of carbureter	Float-feed
Method of lubrication	Splash
Type of clutch	Multiple-disc
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	34x4
Rear tire equipment	34x4



F-A-L CAR, MODEL "N"

Price	$1,850
Type of body	Fore-door roadster
Seats	3
Wheelbase	115½
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	4½x5¼
Horsepower (A. L. A. M.)	27.25
Ignition	High-tension
Type of carbureter	Fload-feed
Method of lubrication	Force-feed
Type of clutch	Cone
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	34x4
Rear tire equipment	34x4

Don't think that it is an extravagance to purchase a vulcanizer.

Don't forget that a power pump is far more likely to afford the requisite pressure for purposes of inflating tires than when a small hand pump is employed.

Don't neglect to determine the cause of loss of compression; a lazy motor is not to be regarded as a joy forever.

Don't think that the timer is so made that you will never have to look at it; disregard of its construction will result in leaving you in the lurch some day—it may be several miles from the bark of a dog.

GLIDE

Price	$2,000
Type of body	Touring
Seats	7
Wheelbase	120
Tread	56
Type of motor	4-cycle
How cooled	Rotary water pump
Number of cylinders	4
Method of casting cylinders	Single
Bore and stroke	4¾x5
Horsepower (A. L. A. M.)	36.1
Ignition	H. T. magneto and coil
Type of carbureter	Float-feed
Method of lubrication	Splash
Type of clutch	Multiple-disc
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	36x4½
Rear tire equipment	36x4½

WESTCOTT, MODEL "F"

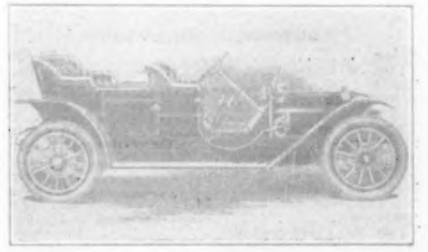
Price	$2,000
Type of body	Touring
Seats	5
Wheelbase	120
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Single
Bore and stroke	4¾x5
Horsepower (A. L. A. M.)	36.1
Ignition	High-tension
Type of carbureter	Float-feed
Method of lubrication	Circulating
Type of clutch	Cone
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	36x4
Rear tire equipment	36x4

Don't use the Kentuckian's whiskey test as a means for determining the character of the lubricating oil you propose to use in your motor; it may look like oil, or it may smell like oil, and it might even taste like oil, but in spite of all these necessary qualifications it might act like trouble.

Don't give up if the demonstrator who sold you a car was able to make it run to your satisfaction and you are not able to duplicate the performance; it merely goes to show that the demonstrator knew how to run the car—you don't.

Don't abandon the idea of finding out how good the cooling system is if a long sandy road on a hot day is not available. With the car standing at the curb and the spark retarded, the average poor radiator will throw up its hands.

Don't figure out that the radiator is amply large for its intended purpose based upon your observation while the car is traveling fast; a good automobile can almost do without a radiator at the higher speed.



OTTO, MODEL "C"

Price	$2,000
Type of body	Touring
Seats	5
Wheelbase	123
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	4¼x4½
Horsepower (A. L. A. M.)	28.9
Ignition	High-tension magneto
Type of carbureter	Stromberg
Method of lubrication	Gear pump and splash
Type of clutch	Cone
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	34x4
Rear tire equipment	34x4

Don't neglect to examine the front axle and wheels at frequent intervals. If the wheels are not in good alignment the chances of steering trouble will be very great. It is even a good idea to so set the front wheels that they will toe in slightly; at any rate they should not toe out.

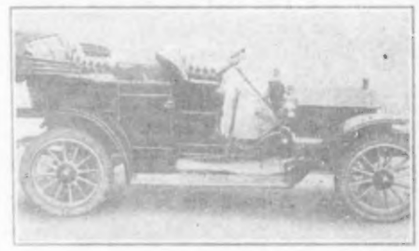
Don't make the mistake of examining every automobile manufactured if you only want to buy one.

Don't assume anything. If the car you put your money in has no means for telling you how much lubricating oil there is in the crankcase, take all your chances in one direction only; keep putting in lubricating oil.

Don't let your "profound" knowledge interfere with your success; an absent-minded moment may cost you a crankshaft; there is danger in racing the motor.

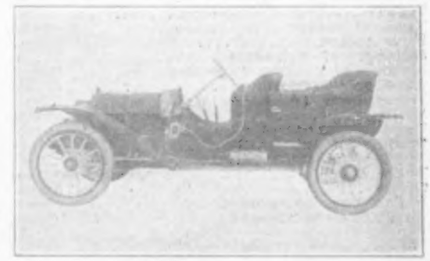
Don't lose hub-caps off a wheel and then run the car for a thousand miles without them; caps are placed to keep dust out of the bearings.

Don't ignore a squeaking sound for a moment; it means that some bearing is crying for lubricating oil; it knows what it wants; be accommodating.



PULLMAN, MODEL "K11"

Price	$2,000
Type of body	Touring
Seats	7
Wheelbase	114
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Single
Bore and stroke	4½x4¾
Horsepower (A. L. A. M.)	32.4
Ignition	High-tension magneto
Type of carbureter	Special
Method of lubrication	Circulating
Type of clutch	Cone
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	34x4
Rear tire equipment	34x4



HAYNES, MODEL "20"

Price	$2,000
Type of body	Touring
Seats	5
Wheelbase	114
Tread	56
Type of motor	4-cycle
How cooled	Gear-driven pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	4¼x5
Horsepower (A. L. A. M.)	28.9
Ignition	High-tension magneto
Type of carbureter	Schebler
Method of lubrication	Circulating
Type of clutch	Contracting band
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	34x4
Rear tire equipment	34x4

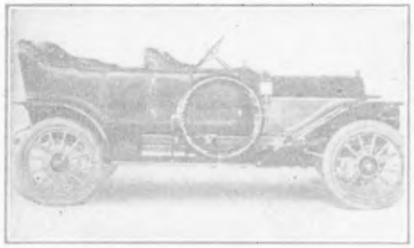
Don't preach fresh air for human beings to the exclusion of the fresh air that will preserve the general good appearance of automobiles; it may appear funny, but while paint and varnish are devoid of the same character of lungs that supports man, they seem to breathe and are poisoned by impure air.

Don't drive fast over loose stones. Better come down to a lower gear; it eases the engine and saves the tires from deep cuts.

Don't invest in a car that has a cooling system that fails to maintain the normal working temperature of the cooling water. If the water boils when the car is standing at the curb, it is a sign that the cooling system is not what it should be.

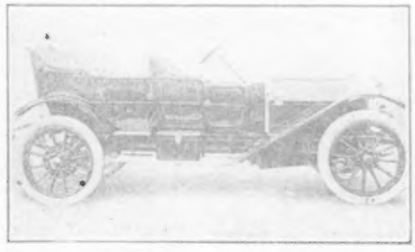
Don't blame the magneto for carbureter troubles, and unless you understand the interior workings of the magneto don't take it apart.

Don't forget that a file is the repairman's lathe, shaper, planer and milling machine. A good file is a very handy tool; all files are not good.



INTERSTATE, MODEL "34-A"

Price	$2,000
Type of body	Torpedo
Seats	5
Wheelbase	118
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	4½x5
Horsepower (A. L. A. M.)	32.4
Ignition	High-tension magneto
Type of carbureter	Stromberg
Method of lubrication	Circulating
Type of clutch	Multiple disc
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	34x4
Rear tire equipment	34x4

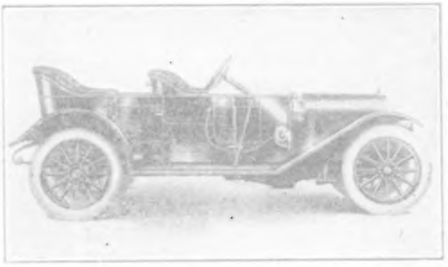


MIDLAND, MODEL "L-2"

Price	$2,100
Type of body	Touring
Seats	7
Wheelbase	115
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	4½x5
Horsepower (A. L. A. M.)	32.4
Ignition	High-tension magneto
Type of carbureter	Optional
Method of lubrication	Circulating
Type of clutch	Multiple disc
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	34x4
Rear tire equipment	34x4

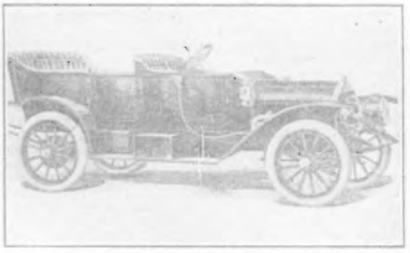
Don't forget that it takes two revolutions of the crankshaft to deliver four strokes.

Don't purchase a motor so small that a muffler cutout will have to be used in order to make the power patch out—what you really need is a motor that will deliver the required amount of power, cutout or no cutout.



CORBIN, MODEL "30"

Price	$2,000
Type of body	Fore-door touring
Seats	4
Wheelbase	115
Tread	56
Type of motor	4-cycle
How cooled	Gear-driven pump
Number of cylinders	4
Method of casting cylinders	Single
Bore and stroke	4½x4¼
Horsepower (A. L. A. M.)	32.4
Ignition	High-tension magneto
Type of Carbureter	Schebler
Method of lubrication	Circulating
Type of clutch	Cone
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	34x4
Rear tire equipment	34x4

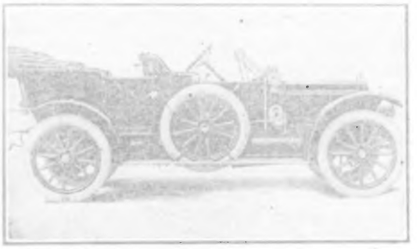


ENGER, MODEL "III"

Price	$2,150
Type of body	Fore-door touring
Seats	5
Wheelbase	116
Tread	56
Type of motor	4-cycle
How cooled	Gear-driven pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	4½x5
Horsepower (A. L. A. M.)	34.25
Ignition	High-tension magneto
Type of carbureter	Schebler
Method of lubrication	Forced-feed
Type of clutch	Multiple disc
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	36x4
Rear tire equipment	36x4

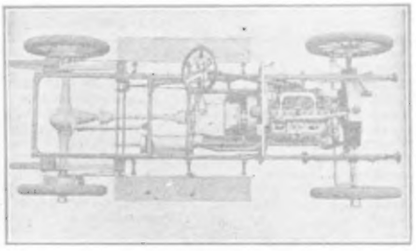
Don't put up with a strange noise; if it is noticed get out a search warrant and serve it upon the pest; it will grow and prosper if you disregard it.

Don't expect a raw patch to stay on a tube; it is like a scab; it will fester and peel off.



RAMBLER, MODEL "63"

Price	$2,175
Type of body	Touring
Seats	4
Wheelbase	112
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Separate
Bore and stroke	5x5½
Horsepower (A. L. A. M.)	40
Ignition	High-tension magneto
Type of carbureter	Rambler
Method of lubrication	Mechanical oiler
Type of clutch	Multiple-disc
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	36x4
Rear tire equipment	36x4



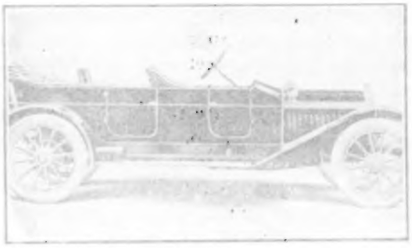
CINO, MODEL "40"

Price	$2,250
Type of body	Touring
Seats	5
Wheelbase	113
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	4½x5
Horsepower (A. L. A. M.)	30.6
Ignition	High-tension magneto
Type of carbureter	Float-feed
Method of lubrication	Circulating
Type of clutch	Cone
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	34x4
Rear tire equipment	34x4

Don't fail to remove all the lubricating oil, and after replacing it with a normal grade, determine what the true conditions of compression are; the power of a motor, as well as the fuel economy, increases with compression.

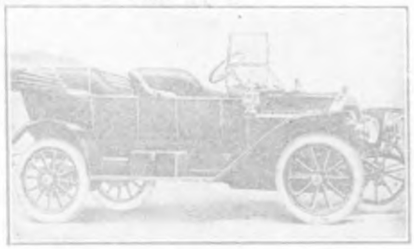
Don't be careless when washing the car; water may find its way into the carbureter; the ball-bearings in the road wheels may also be given a water bath—what they need is oil, not water.

Don't count ignition as one of the operations in the four-stroke cycle motor—ignition is but an incident in counting the operations that make up the cycle.



ATLAS, MODEL "O"

Price	$2,400
Type of body	Fore-door touring
Seats	7
Wheelbase	120
Tread	56
Type of motor	2-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	4½x4½
Horsepower (A. L. A. M.)	32.4
Ignition	High-tension
Type of carbureter	Atlas
Method of lubrication	Oil fed with fuel
Type of clutch	Plate
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	36x4
Rear tire equipment	36x4



OHIO, MODEL "40-L"

Price	$2,450
Type of body	Torpedo
Seats	5
Wheelbase	115
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	4½x4¾
Horsepower (A. L. A. M.)	32.4
Ignition	High-tension
Type of carbureter	Schebler
Method of lubrication	Circulating
Type of clutch	5-plate disc
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	34x4
Rear tire equipment	34x4

Don't expect to go too far on a gallon of gasoline; some of the distances covered (theoretically) on this amount of fuel are past practical mention.

Don't start out with a little lubricating oil; have as much as there is storage room for; it is marvelous how much damage that can result from the absence of lubricant for just five minutes.

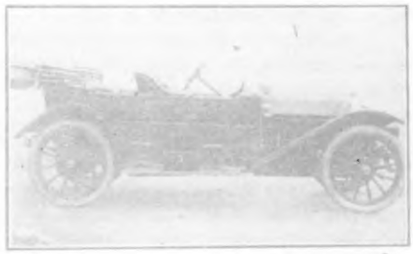
Don't fall in love with the magneto to the extent of neglecting the battery ignition; an old friend comes handy in in a pinch.

Don't expect a battery to be in good working order after it has stood in idleness for a year and a day; it may be a wizened old man incapable of active service when you get to it.

Don't neglect the wiring; it should be examined at regular intervals; poor joints offer a high electrical resistance and defeat service.

Don't forget that trouble hates a systematic man.

Don't expect to procure all the Cardinal Virtues for $15 per week; a good chauffeur is worth a price.



MCFARLAN, MODEL "32"

Price	$2,500
Type of body	Touring
Seats	7
Wheelbase	128
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	6
Method of casting cylinders	Pairs
Bore and stroke	4x5
Horsepower (A. L. A. M.)	38.4
Ignition	High-tension
Type of carbureter	Float-feed
Method of lubrication	Positive
Type of clutch	Multiple disc
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	36x4
Rear tire equipment	36x4

DORRIS, MODEL "F"

Price	$2,500
Type of body	Touring
Seats	5
Wheelbase	115
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	4¾x5
Horsepower (A. L. A. M.)	36.1
Ignition	High-tension
Type of carbureter	Stromberg
Method of lubrication	Circulating
Type of clutch	Multiple disc
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	36x4
Rear tire equipment	36x4

Don't hypnotize yourself into believing that a fore-door type of car will be too warm for Summer time; it certainly will be comfortable in the Winter time, and when the dog days arrive you can throw the fore-door away if you want to.

Don't persuade a lazy chauffeur to use the seat in your car as a bed to sleep in.

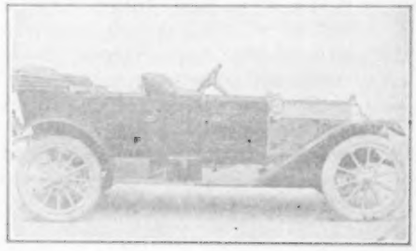
Don't assume that the wiring is perfect simply because the joints are in good order; there may be a fault in the wire under the insulation at some point; feel along the insulation until you come to a spot that indicates lack of continuity, just as a doctor examines for a fractured bone in the arm.

Don't neglect the contacts in the magneto and timer; they have to stand a large amount of rubbing and in time the effect is to wear them out; replace them at the right time.

Don't go by a school-house like a whirlwind; how would you like to have you own children placed at the tender mercy of a lunatic with an automobile for a weapon?

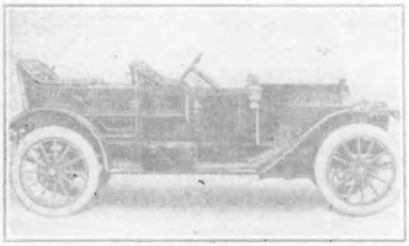
SELDEN, MODEL "44"

Price	$2,500
Type of body	Fore-door touring
Seats	4
Wheelbase	125
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	4¾x5
Horsepower (A. L. A. M.)	36.1
Ignition	High-tension magneto
Type of carbureter	Stromberg
Method of lubrication	Circulating
Type of clutch	Cone
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	36x4
Rear tire equipment	36x4



LEXINGTON, MODEL "A"

Price	$2,500
Type of body	Fore-door touring
Seats	7
Wheelbase	122
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Single
Bore and stroke	4¾x5
Horsepower (A. L. A. M.)	36.1
Ignition	High-tension magneto
Type of carbureter	Shebler
Method of lubrication	Gear pump and splash
Type of clutch	Cone
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	36x4½
Rear tire equipment	36x4½



NATIONAL, MODEL "40"

Price	$2,600
Type of body	Touring
Seats	5
Wheelbase	124
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	5x5 11-16
Horsepower (A. L. A. M.)	40
Ignition	High-tension magneto
Type of carbureter	Schebler
Method of lubrication	Circulating
Type of clutch	Cone
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	36x4
Rear tire equipment	36x4

Don't forget, it is not what a man knows, but what he does, that is worth money. Get a chauffeur that knows less if necessary.

Don't handle a squirt-can as if you are trying to put out a fire; clean out the oil-hole and then properly insert the spout of the can in place and make sure that a few drops of the lubricant will reach the surfaces to be lubricated.

Don't forget that lubricating oil wears out just as shoes and other things depreciate in service. Clean out the old oil before putting in new—what's the use of spoiling the new supply and defeating the aim?

Don't get the impression that a gallon of good lubricating oil in the "sump" in the lower half of the crankcase will be of any value in keeping a main bearing from freezing; better results will come from a drop of oil on the bearing surface—look after the circulation.

Don't go on a tour with a large number of poor tools; take along a few good ones.

Don't fail to keep coal gas, carbonic acid and sewer products out of the garage; the varnish will mottle up on such feed.

Don't dispute the right of way with a fire engine; besides being a formidable rival it may be on its way to put out a fire at your house or place of business.

Don't be careless when putting tires on; the inner tube should be carefully inserted, laps are sure to do damage; just take the extra moment to examine the inner tube and see if it is properly in place.

Don't add all the complications that the world affords to your automobile; get everything that will be of value; eliminate everything that can be of no adequate service.

MARMON, MODEL "32"

Price	$2,750
Type of body	Touring
Seats	5
Wheelbase	120
Tread	56½
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	4½x5
Horsepower (A. L. A. M.)	32.4
Ignition	High-tension
Type of carbureter	Schebler
Method of lubrication	Circulating
Type of clutch	Cone
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	34x4
Rear tire equipment	34x4

Don't let calcium carbide ash remain in the generator after it has rendered a good night's service; the residuum (ash) is a biting mass that will ruin the generator and compel the purchase of a new one; it takes but a moment to clean out the generator.

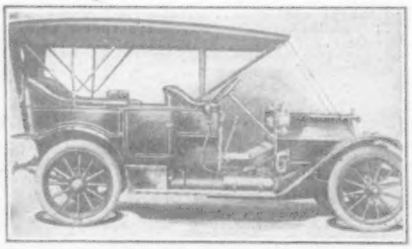
with the understanding, from his point of view, that he can go elsewhere if his last purchase fails to meet with his approbation.

The probabilities are that the increase in price that brings automobiles within this classification increases enormously the exactions of the customers, and since every expense must ultimately be paid by the purchasers of product, it remains to be stated that the exactions of those who have a penchant for the most pretentious types of automobiles are met with equanimity, and a part of what they have to pay for is represented in the minute care with which each little detail is studied and satisfied, and a condition of noiselessness is induced to the last degree.

Don't imagine that the differential gear that is placed in the live rear axle can be done away with advantageously; it is put there to weigh out the torquing moment to the two traction wheels, permitting each to go at its natural speed—one of the wheels must go faster than the other in rounding a curve unless one of the tires slips.

Don't let the repairman tell you that he is going to burn off all the old finish and refinish from the ground up, and then let him get away with a retouching job instead—a little superintendence once in a while does no harm.

Don't fail to take into account the ruinous effect of oil on the tires; but if the tires will rot out if they are steeped in oil, how about the high-tension wiring around the motor? It, too, has rubber for insulation.



SPEEDWELL, MODEL "11-F"

Price	$2,800
Type of body	Touring
Seats	7
Wheelbase	121
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	5x5
Horsepower (A. L. A. M.)	40
Ignition	High-tension magneto
Type of carbureter	Schebler
Method of lubrication	Mechanical oiler
Type of clutch	Cone
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	36x4½
Rear tire equipment	36x4½

Automobiles Costing More Than $3,000

THE list of makers of the types and models of automobiles that cost more than $3,000, and even more than $5,000 in a few cases, is a large but not necessarily growing one, and an examination of this list discloses the fact that these cars are the product of pioneer makers in every instance, so that the inference is that the man who pays $5,000 for an automobile can well afford to do so, and he lends the support of his patronage to the company who commands his confidence,

Don't let the demonstrator persuade you to believe that the radiator is big enough if it offers all the evidences of a steam boiler blowing off.

Don't flatter yourself that you are so much smarter than anyone else as to permit you to enjoy many demonstrations and not have to pay for taking up the time of the many demonstrators.

Don't jump to the conclusion that the chauffeur is incompetent just because you have indigestion—his stomach may be in good working order.

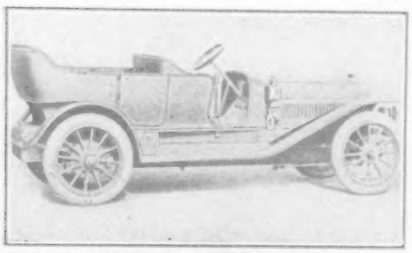
Don't be a road hog; you are only one in 90,000,000. If you want a whole road for yourself, build one in your own back yard.

Don't run on a flat tire just because it is something of a job to make a roadside repair—10 miles of flat running will foot up to the price of a tube and a casing; even a single block may be a sufficient distance to bruise the fabric beyond repair.

Don't place $30 worth of tools in the tender keeping of a tonneau (under the seat) with the floor boards so loosely inserted that the tools will be scattered hither and yon along the roadside.

Don't mistake a fine line of talk from an engaging salesman for chrome nickel steel in a crankshaft or other refinements in a car. Just keep in mind the fact that the salesman don't make the car.

Don't shoot down your intelligence in cold blood; this is what you do when you abuse your chauffeur for keeping your automobile in good working order.



WINTON, MODEL "17-B"

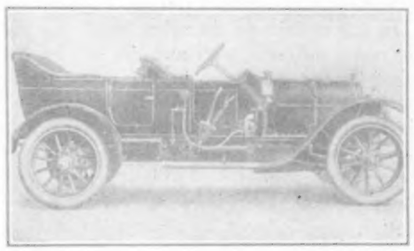
Price	$3,000
Type of body	Touring
Seats	4
Wheelbase	130
Tread	56½
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	6
Method of casting cylinders	Pairs
Bore and stroke	4½x5
Horsepower (A. L. A. M.)	48.6
Ignition	High-tension magneto
Type of carbureter	Stromberg
Method of lubrication	Circulating
Type of clutch	Multiple-disc
Transmission	4-speed selective
Drive	Shaft
Front tire equipment	36x4
Rear tire equipment	36x4½

Don't let the hose connections of the water piping become sloppy. Just as soon as they show that they have done all the good work that may be expected of them, replace them with new sections; the cost is but a trifle—this plan will save a bad half-hour on the road some dark night when it is raining.

Don't argue with the chauffeur about what he is to do—get one that will know without having to be persuaded.

Don't try to acquire all the cardinal virtues in a chauffeur; he will shine too brilliantly in your presence if you get him.

Don't use an open exhaust in towns or near houses in the country late at night; you have no right to disturb other people's sleep.



POPE-HARTFORD, MODEL "W"

Price	$3,000
Type of body	Touring
Seats	5
Wheelbase	124
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	4¾x5½
Horsepower (A. L. A. M.)	36.1
Ignition	High-tension magneto
Type of carbureter	Pope-Hartford
Method of lubrication	Circulating
Type of clutch	Cone
Transmission	4-speed selective
Drive	Shaft
Front tire equipment	36x4½
Rear tire equipment	36x4½

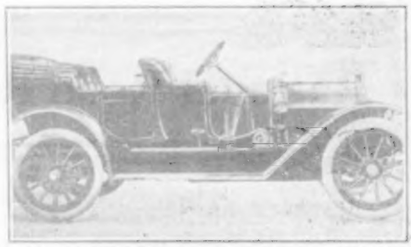
Don't be satisfied with a man who says he is thoroughly capable, especially if he is good at making excuses.

Don't forget that an automobile is like a hound; if it cannot run it is scarcely worth feeding.

Don't think that the cheapest policy of automobile insurance is the best; what you insure for is that in case of accident you will be paid.

Don't forget that racing cars frequently wear out a few thousand dollars' worth of tires in a single day; speed is what does it.

Don't be fooled by the chauffeur who keeps the brass work polished; you can get that work done for a nickel by a bootblack; see that the "man" cleans out the gearcase, crankcase, and other lodging houses for stale lubricant.



COLUMBIA, MARK "48-5"

Price	$3,000
Type of body	Touring
Seats	7
Wheelbase	115
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	4½x4 7-10
Horsepower (A. L. A. M.)	32.4
Ignition	Low-tension magneto
Type of carbureter	Columbia
Method of lubrication	Circulating
Type of clutch	Cone
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	34x4½
Rear tire equipment	34x4½

Don't select the automobile that you are to pay good money for because it will go like the dickens on a billiard board or a boulevard; you might have to hire a horse to pull it up hill.

Don't fail to take up the slack of the side-chains as often as may be required; in performing this operation be sure and maintain the alignment of the rear axle.

Don't try to run the side-chains too tight; they should be given about one-half a link length of slack.

Don't neglect to keep the side-chains well lubricated. Lubricant protects the joints from the abrasive influence of sand and other road-side accumulations.

Don't forget that it is a costly expedient filling the tonneau even if it is the lesser of two evils.

Don't forget to look after the insurance policy of your automobile just before you send it to a repair shop; places like that do burn down.

Don't place yourself in the position of the armless man who purchased gloves because they were cheap; the prudent selection of accessories will reduce the cost of automobiling a mile and a half.

Don't overlook the pleasure that follows if the chauffeur belongs to the class who keep automobiles in good working order; the saving in dollars is but a small part of the advantage.

Don't ask a "native" for directions to the place to which you want to go; natives are notoriously inaccurate—equip yourself with "canned" directions in the form of a reliable guide book.

Rational Road Regulations

PREPARING A FOUNDATION FOR UNIFORM AND JUST AUTOMOBILE TRAFFIC REGULATION—SIGHT AND SOUND SIGNALS

Assuming that the object of regulation of traffic is in all cases the furtherance of tranquil conditions, the possible causes of disturbance may be divided into five classes, those originating with (A) the driver, (B) the vehicle and its makers, (C) pedestrians and other traffic members, (D) the State and its officials and (E) public opinion as vented in the public press.

A.—The driver may be of (1) an insolent disposition and constitutionally inclined to run roughshod over those upon whom he looks down as inferior beings. He may be (2) inebriated and thereby temporarily deprived of decency, common sense and the full use of his physical faculties. He may be (3) permanently deficient, having poor sight or hearing or being subject to nervous collapse in emergencies.

B.—The vehicle may (4) possess peculiarities affecting the driver's actions and faculties. It may be (5) faulty in its control elements. It may be (6) of appearance so odd as to scare horses, or it may be (7) used in districts where any automobile scares horses. It may (8) possess certain peculiarities through which its speed or the direction of its motion fails to be accurately or quickly perceived by the average person.

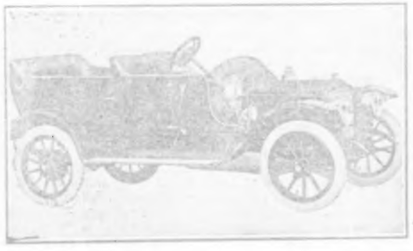
C.—Pedestrians and drivers of vehicles in the traffic, including drivers of automobiles, may be (9) insolent and inclined to make trouble. They may stubbornly insist that the slow member of the traffic has as good a right to all of his slowness as the automobile driver has to some of his speed. They may be (10) inebriated. They may be (11) deficient, having poor sight or hearing, or both, or being subject to nervous collapse in emergencies. They may be (12) unaccustomed to the sight of automobiles.

D.—The State, through its officials, may be (13) poorly informed (14) venal or biased, with all the results flowing from such condition in the way of bad laws, poorly enforced laws, exasperation of the traffic members, including the automobile drivers, contempt for all regulation, tricky legal quibbling on technicalities. The State may be (15) poorly organized for the enforcement of law.

E.—The public press which voices and shapes public opinion may be (16) following false channels, catering to class interests or failing to spread information of essentials when these lie beyond the horizon of the average reader.

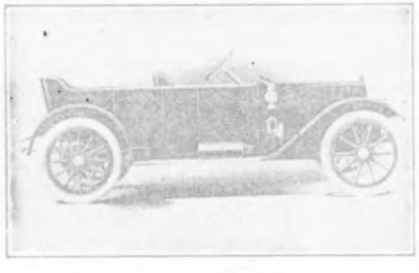
IN horse-driven vehicles the up-and-down motion of the animals, the movements of their legs and the sounds of their footfall are the factors which maintain a continuity of changes in the sense images produced in one who gets in the line of vision or within the radius of hearing. Each sense image produced is distinctly different from the following one or, in the case of the sounds, is at least distinctly separated from the following one and judgment of distance is assisted by the nearly uniform size of horses (considering only those capable of speed). The succession of sense images conveys an accurate impression of speed and direction. When the vehicle turns to either side the whole large body of the horse takes a new angle to the beholder and the sense image of the turning vehicle becomes distinctly different from that of a vehicle continuing its course. In the case of street cars the track is a continuous sight signal observed whenever the eye turns in that direction and the sounds are, as a rule, strong and distinctive. The automobile, on the other hand, is made in many different sizes and the size of the sight image produced in the other traffic member does not necessarily convey an idea of distance. A large car far away and a small car nearby produce images somewhat similar. Twilight, mist and lamp effects sometimes aggravate a delusion superinduced by absence of distinct sounds. Nothing in the automobile moves up and down. The wheels produce about the same image whether they rotate fast or slowly. The gray of the tire is inconspicuous. The whole body of the car remains like unto itself always and therefore produces a succession of sense images in which there is little change. The cat sneaking upon a bird—making its legs escape notice by drawing them slowly and gradually from one position to another, merged against its furry body, and presenting from one moment to the next as closely as possible an unchanging contour, while yet moving constantly closer to its victim—is scarcely better adapted than the automobile for confounding that co-operation of the senses and the mind upon which, in the case of street and road traffic, the security largely depends. If the automobile turns or swerves, no other indication of the changed direction is visible than a faint change of angle of the inconspicuous wheels in front and the meaning of that is to a certain extent contradicted by the lack of change in the other front portions of the vehicle, besides that certain relations between the movements of the automobile and the movements of the other traffic member easily arise by which the sense image produced by the automobile remains practically unchanged in spite of the turn.

This condition, rendering a clear and accurate preception of the speed and direc-



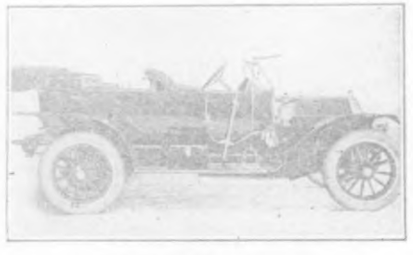
WHITE, MODEL "GE"

Price	$3,200
Type of body	Torpedo
Seats	5
Wheelbase	120
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Block
Bore and stroke	4¾x5⅛
Horsepower (A. L. A. M.)	36.1
Ignition	High-tension magneto
Type of carbureter	White
Method of lubrication	Circulating
Type of clutch	Cone
Transmission	4-speed selective
Drive	Shaft
Front tire equipment	34x4
Rear tire equipment	34x4



CHALMERS, MODEL "40"

Price	$3,000
Type of body	Torpedo
Seat	4
Wheelbase	120
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	5x4¾
Horsepower (A. L. A. M.)	40
Ignition	High-tension
Type of Carbureter	Stromberg
Method of lubrication	Circulating
Type of clutch	Cone
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	36x4
Rear tire equipment	36x4



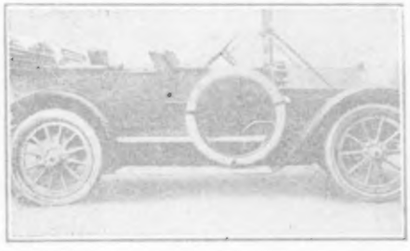
KNOX, MODEL "R"

Price	$3,400
Type of body	Torpedo
Seats	4
Wheelbase	122
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Single
Bore and stroke	5x4¾
Horsepower (A. L. A. M.)	40
Ignition	High-tension
Type of carbureter	Stromberg
Method of lubrication	Circulating
Type of clutch	3-plate
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	36x4½
Rear tire equipment	36x4½

tion of automobiles difficult to other traffic members, has existed since automobiles were introduced. If they had existed without increase of speed they would still have reduced the safety of traffic inasmuch as they interfered with a suitable observance of caution on the part of one of the two parties in the traffic (considering each instance of possible disturbance as composed of the two parties between whom disturbance might arise) and rendered it necessary that one of the parties should take upon himself alone the whole burden of looking out. With the speed of the automobile added as a factor in the situation, it became indeed generally recognized in practice that the duty of caution should be delegated mainly upon the party who is not handicapped; that is, upon the driver of the automobile. It was made his duty to signal.

Sound signals are in use because their necessity under the traffic conditions has been perceived. But they are not operated unless the automobile driver discovers that a special need for it has arisen. These are necessarily just those instances when the other traffic member has failed to discover the needs of the situation, for one reason or another. By the law of chances there must be an equal number of instances in which the automobile driver fails to discover the specific necessity, and therefore does not sound his signal. In addition there are the instances when he could not discover the necessity because it is concealed in some special disability of the other traffic member. Also, the signalling sometimes aggravates a situation by its suddenness, paralyzing the other party's faculties. As a remedy for the condition which the sound signal operated by the automobile driver is intended to obviate, it has evidently less than a 50 per cent. efficiency. It is less than 50 per cent. good. Hence, more than 50 per cent of the undesirable condition remains.

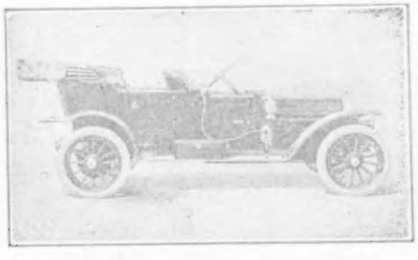
In other words, sound signals proved an insufficient measure for offsetting both the effects of the higher speed and the effects of the reduced accuracy of observation, and the condition of traffic was such that stringent speed regulations were passed and in the course of time the true causes of the insecurity remained undiscovered, a number of other regulative measures were adopted, most of them based on the supposed competence of one person to pass upon the competence of another for driving an automobile and some of them badly mixed with matters of taxation which have nothing to do with traffic regulation. A generally unsatisfactory condition has been produced, further aggravated by marked variations in the regulations passed by the different States. The average speed is lower than it need be and the security is at the same time less than it ought to be, the restrictions more onerous for owners of automobiles than they can reasonably continue to be, granting that all vehicles will be automobiles in course of time. And this condition is largely due to the fact that one-half of the caution which maintains security has been crippled through certain sins against the laws of physiology.



Sight and hearing have both been reduced "50 per cent." in value; sight through direct violation of the laws under which sight images convey meaning to the mind; hearing partly for the same reason (the automobile giving either no sound or a continuous one with little variation to impress the auditory nerves) and partly because the sound signals of the automobile are not brought into action unless the automobile driver perceives the necessity. Little wonder that legislators who failed to appreciate these causes for the reduction of security in the traffic, but did perceive that the speed of automobiles was higher than that of other traffic members, singled out speed as the factor to be suppressed.

It happened on a country road in Pennsylvania that an automobile, going at a moderate clip of 30 miles an hour—which ought to be a moderate clip on a country road—turned a rounded corner lined with high hedges. There, coming against it, were two spring wagons, each carrying a load of gay, swarthy young people, born under sunny skies beyond the pond. They were racing a bit, if a single horse dragging a load of six or eight persons can be said to be racing, when one-half of its motion is up and down. But they covered the width of the road, and the next second saw one of the horses with one forefoot in the radiator and the other on the hood. Result: five days of delay and a repair bill of $300; also a suit at law, which was compromised for $25 to avoid further delay. And the driver of the automobile was very fully convinced that the entire blame rested upon the gay party. A continuous sound signal, commensurate in some manner with the speed and recognized distinctively and instinctively as that of an automobile, would probably have averted the trouble without need of interfering with either the gayety of one party or the average speed of the other.

When the automobile associations shall begin to gather material for an automobile law that shall be acceptable to all States by its intrinsic merit it seems that one of the very first cares should be directed upon restoring to all the members of the traffic

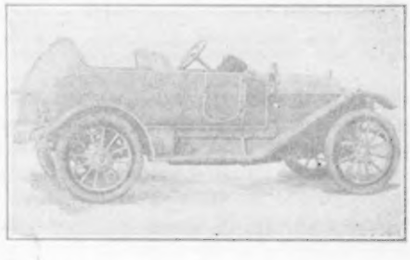


STEVENS-DURYEA MODEL "AA"

Price	$3,500
Type of body	Fore-door touring
Seats	5
Wheelbase	128
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	6
Method of casting cylinders	Pairs
Bore and stroke	4¼x4¾
Horsepower (A. L. A. M.)	43.8
Ignition	High-tension magnetc
Type of carbureter	Stevens-Duryea
Method of lubrication	Circulating
Type of clutch	Multiple disc
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	36x4½
Rear tire equipment	36x4½

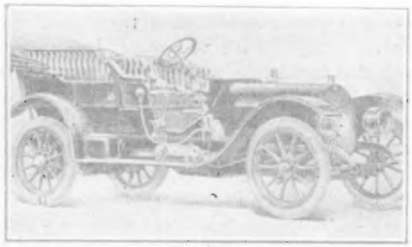
OLDSMOBILE, MODEL "AUTOCRAT"

Price	$3,500
Type of body	Touring
Seats	7
Wheelbase	124
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Metnod of casting cylinders	Pairs
Bore and stroke	5x6
Horsepower (A. L. A. M.)	40
Ignition	High-tension magneto
Type of carbureter	Olds
Method of lubrication	Circulating
Type of clutch	Cone
Transmission	4-speed selective
Drive	Shaft
Front tire equipment	38x4½
Rear tire equipment	38x4½



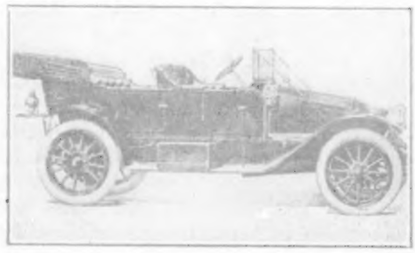
STUDEBAKER-GARFORD, MODEL "8-10"

Price	$3,500
Type of body	Torpedo
Seats	5
Wheelbase	116
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	4¼x5¼
Horsepower (A. L. A. M.)	28.9
Ignition	Low-tension
Type of carbureter	Garford
Method of lubrication	Mechanical oiler
Type of clutch	Cone
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	36x4
Rear tire equipment	36x4



MATHESON, MODEL "SIX-18"

Price	$3,500
Type of body	Touring
Seats	5
Wheelbase	125½
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	6
Method of casting cylinders	Pairs
Bore and stroke	4½x5
Horsepower (A. L. A. M.)	48.6
Ignition	High-tension magneto
Type of carbureter	Stromberg
Method of lubrication	Circulating
Type of clutch	Multiple disc
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	36x4
Rear tire equipment	36x4

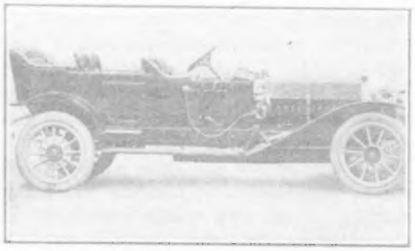


FRANKLIN, MODEL "D"

Price	$3,500
Type of body	Touring
Seats	5
Wheelbase	123
Tread	56
Type of motor	4-cycle
How cooled	Air-cooled
Number of cylinders	6
Method of casting cylinders	Single
Bore and stroke	4x4
Horsepower (A. L. A. M.)	38.4
Ignition	High-tension
Type of carbureter	Franklin
Method of lubrication	Mechanical oiler
Type of clutch	Multiple disc
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	36x4½
Rear tire equipment	37x5

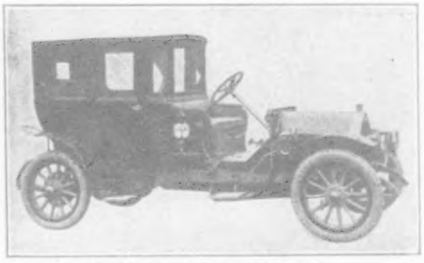
the advantageous use of sight and hearing which existed before the automobile came into the field. The means to this end should not be fanciful or odd, but strictly in accordance not only with the physiological laws, which require motion in the sense image to convey motion of the thing, but also with good taste and good mechanical sense.

If automobilists themselves had perceived the value of continuous sound and sight signals and had taken time to reflect on the benefits to their own class sure to be the result in the long run of consideration for others, even if these others were often far from gracious in acknowledging the road rights of the automobilists, such continuous sound and sight signals would probably long ago have been mechanically developed. The sight signal should show plainly and at a sufficient height one or more moving parts, whose movements should at the same time be adapted to catch the eye and to visualize the speed of the automobile and should also show plainly any change in the direction of motion. Lamps, which are the sight signals generally acknowledged to be necessary at night, far from comply with these requirements, but could probably be arranged so as to render the sight signals for daylight effective at night as well. The continuous sound signal—recognized, for that matter, as necessary for fire chiefs and ambulances—should of course be unobtrusive, so as not to become a nuisance, but on the other hand very distinctive, as is the footfall of the horse, and, unlike the footfall of the horse, it should be independent of the road surface, thereby offering an advantage commensurate with the greater urgency of caution due to the greater speed of the automobile. The sounds should be relatively dull and should have in them very little of a musical character since all musical notes become tiresome by repetition. Their pitch should be recognizable though blurred and subject to indistinct variations and their cadence should be slightly irregular, both these qualities to assist in producing a clear sound image of speed variations without any extravagance of sound volume or that nausea of the ear which results from absolutely exact repetitions of identical sound values. The progress noted in the intermittent sound signals



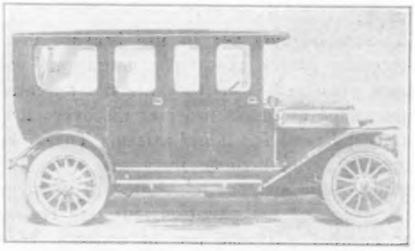
PREMIER, MODEL "6-60"

Price	$3,650
Type of body	Touring
Seats	7
Wheelbase	140
Tread	56½
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	6
Method of casting cylinders	Pairs
Bore and stroke	4½x5½
Horsepower (A. L. A. M.)	48.6
Ignition	Low-tension
Type of carbureter	Stromberg
Method of lubrication	Circulating
Type of clutch	Multiple disc
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	36x4½
Rear tire equipment	36x5



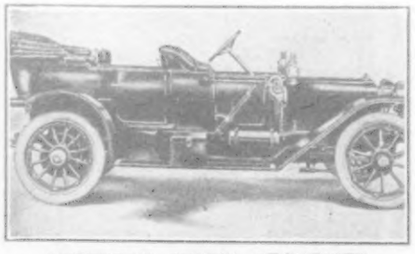
THOMAS, MODEL "R"

Price	$4,000
Type of body	Brougham
Seats	6
Wheelbase	123
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	4¼x5½
Horsepower (A. L. A. M.)	28.9
Ignition	High-tension
Type of carbureter	Stromberg
Method of lubrication	Mechanical oiler
Type of clutch	Multiple disc
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	34x4½
Rear tire equipment	34x4½



STODDARD-DAYTON, MODEL "11-F"

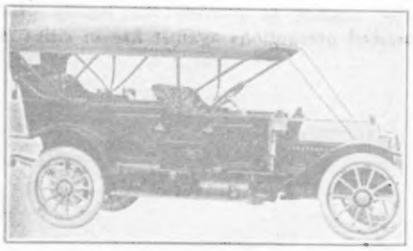
Price	$4,000
Type of body	Limousine
Seats	7
Wheelbase	130
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	5x5½
Horsepower (A. L. A. M.)	40
Ignition	High-tension
Type of carbureter	Stromberg
Method of lubrication	Circulating
Type of clutch	Cone
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	36x5
Rear tire equipment	36x5



AMERICAN, MODEL "TOURIST"

Price	$4,250
Type of body	Fore-door touring
Seats	7
Wheelbase	124
Tread	56
Type of motor	4-cycle
How cooled	Water-pump circulation
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	5⅜x5½
Horsepower (A. L. A. M.)	46
Ignition	High-tension magneto and coil
Type of carbureter	Special
Method of lubrication	Circulating
Type of clutch	Cone
Transmission	4-speed selective
Drive	Shaft
Front tire equipment	36x4
Rear tire equipment	36x5

in actual use, though it has been slow and punctured with many fanciful digressions. seems to indicate that only on these lines can continuous sound signals become tolerable, esthetically, as well as useful. The succession of the sounds should be so slow that at the highest speeds each sound is still heard as distinct from the next one. When looking around for the probable character of a signal device combining the requirements for the sounds and for the sights, different minds will probably see the subject at somewhat different angles, but it seems clear that it comes easily within the range of competitive invention, involving only the most elementary mechanical problems, which, however, may be solved with more or less taste and efficiency.



AMPLEX, MODEL "A"

Price	$4,300
Type of body	Fore-door touring
Seats	7
Wheelbase	128
Tread	56
Type of motor	2-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	5 1/16x5
Horsepower	41
Ignition	High-tension magneto
Type of carbureter	Vortex
Method of lubrication	Force-feed
Type of clutch	Disc
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	36x4
Rear tire equipment	36x5

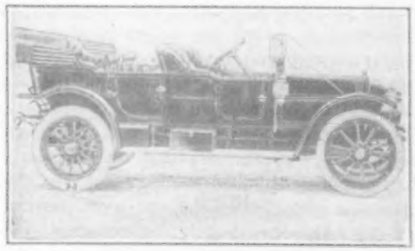
ROYAL TOURIST, MODEL "M-3"

Price	$4,500
Type of body	Fore-door touring
Seats	5
Wheelbase	126
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	5½x6
Horsepower (A. L. A. M.)	48.4
Ignition	High-tension
Type of carbureter	Royal
Method of lubrication	Circulating
Type of clutch	Cone
Transmission	4-speed selective
Drive	Shaft
Front tire equipment	36x4½
Rear tire equipment	36x5

The writer can readily imagine an apparatus rising moderately from the top of the radiator, say 15 inches above it, and comprising a frame with one or two pendulums, or strikers, adapted to swing to and fro, thereby striking with greater or lesser force, as well as greater or lesser frequency, pieces of dry wood or other material—which should make sounds duller than those of a xylophone—and the whole

ALCO, MODEL "40"

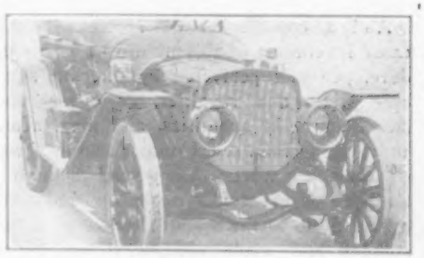
Price	$4,500
Type of body	Limousine
Seats	7
Wheelbase	126
Tread	55⅛
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	5⅛x5½
Horsepower (A. L. A. M.)	42
Ignition	High-tension magneto
Type of carbureter	Alco
Method of lubrication	Circulating
Type of clutch	Multiple-disc
Transmission	4-speed selective
Drive	Shaft
Front tire equipment	36x4
Rear tire equipment	35x5



STEARNS, MODEL "30-60"

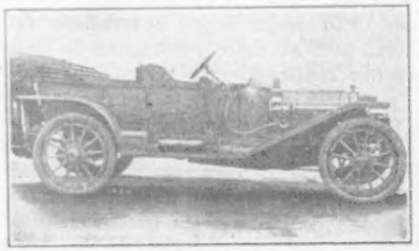
Price	$4,600
Type of body	Touring
Seats	7
Wheelbase	124
Tread	56½
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	5⅛x5⅞
Horsepower (A. L. A. M.)	46
Ignition	High-tension magneto
Type of carbureter	Stearns
Method of lubrication	Circulating
Type of clutch	Multiple-disc
Transmission	4-speed selective
Drive	Shaft
Front tire equipment	36x4
Rear tire equipment	36x5

actuated from the front wheels by alternately pushing one rod and another along the front axle. When the front wheels were turned to go in a new direction the push of one of them on the adjacent rod would be increased in force and length of motion, and the signal device would be turned correspondingly and would produce



LOZIER, MODEL "46"

Price	$4,600
Type of body	Touring
Seats	7
Wheelbase	124
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	5⅜x6
Horsepower (A. L. A. M.)	46
Ignition	High-tension
Type of carbureter	Optional
Method of lubrication	Mechanical oiler
Type of clutch	Disc
Transmission	4-speed selective
Drive	Shaft
Front tire equipment	36x4
Rear tire equipment	36x5



LOCOMOBILE, MODEL "M"

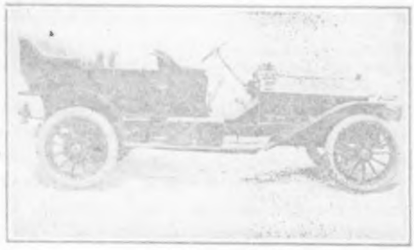
Price	$4,800
Type of body	Torpedo
Seats	5
Wheelbase	135
Tread	54
Type of motor	4-cycle
How cooled	Centrifugal water pump
Number of cylinders	6
Method of casting cylinders	Pairs
Bore and stroke	4½x4½
Horsepower (A. L. A. M.)	48.6
Ignition	High-tension magneto
Type of carbureter	Locomobile
Method of lubrication	Forced-feed
Type of clutch	multiple-disc
Transmission	4-speed selective
Drive	Shaft
Front tire equipment	36x4
Rear tire equipment	37x5

a more than usually irregular succession of sounds, and a flexible connection between the rods sliding upon the front axle and the pendulum device would produce a certain irregularity at all times, owing to the variations in the road surface causing the front axle to bob up and down more or less with the action of the vehicle springs. The size, shape and colors of the pendulums and the frame should, of course, be selected with a view to constituting an efficient sight signal, whether held straight or turned with the wheels, and at night the lamplight should be arranged to play on the device in some manner. On the whole it seems clear that there is nothing to hinder capable inventors from designing and perfecting a suitable device the moment its necessity shall have become recognized.

And a commission of specialists may cause inventions of this nature to be made, developed and perfected by offering suitable prizes and royalties, or orders for manufacture in quantities, and may, after thorough testing, select one or two or three of them as worthy of official approval, those to be eventually made for and sold by the State to the manufacturers of automobiles and made obligatory for automobilists.

A rapid recapitulation of the other causes of traffic troubles will bring out what is most important among other requirements for the regulation of ordinary traffic.

(1) Insolence among automobile drivers is only a variety of a disposition verging upon criminality and to be met by the same means as the State employs or should employ against other forms of irresponsible conduct, except in so far as it may be shown that the ultimate causes of insolent acts and omissions by automobile drivers are to be sought largely in removable factors, such as those peculiarities in automobile construction as referred to under (4) and in perfunctory or *pro forma* legislation and other factors in which case the removal of these factors will naturally reduce the numerous instances where an apparently insolent disposition is only the last link in a chain of circumstances which cause traffic trouble to that much smaller number of cases where the disposition of the driver is really and truly criminal, consisting in a sustained defiance or subversion of contemporary public opinion, laws and morals. As motives for crime are in nearly all these cases absent, it stands to reason that the true causes are to be found outside of the offending individual, and that the best course to pursue should consist in their removal rather than in maintaining the difficult condition and punishing individuals who are not quite well enough balanced to find a method of driving which is acceptable not only to themselves and to others, but likewise to the law.

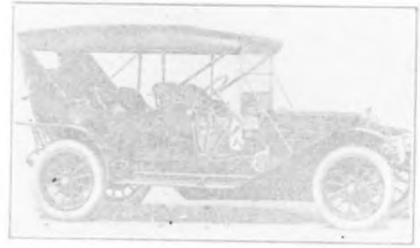


CHADWICK, MODEL "19"

Price	$5,500
Type of body	Touring
Seats	7
Wheelbase	133
Tread	56½
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	6
Method of casting cylinders	Pairs
Bore and stroke	5x6
Horsepower (A. L. A. M.)	60
Ignition	High-tension magneto
Type of carbureter	Chadwick
Method of lubrication	Mechanical oiler
Type of clutch	Internal-expansion
Transmission	4-speed selective
Drive	2 chains
Front tire equipment	36x4
Rear tire equipment	37x5

(2) Intoxication of drivers. The situation created by the combination of alcoholic effects with a heavy vehicle capable of running automatically at very high speed and obeying unquestionably every control movement dictated by an intoxicated brain or due to the haphazard actions of inebriated hands and feet, is a new one in law and morals, having received practically no public consideration, though the situation has existed since automobiles began to become a common means of transportation and is getting steadily worse, in proportion as automombiles are getting more numerous and are getting more and more in the hands of persons whose capacity for self-restraint and inhibition of reckless impulses has in nowise been cultivated. One of the most potent factors for preventing an improvement of this situation lies in the accepted legal assumption that the intoxicated individual is to be considered as irresponsible for his acts, in greater or lesser degree according to the degree of his inebriation, and practically in a class with demented persons, and in the belief that no legislation can or should be allowed by the courts to overcome this principle of legal philosophy. This legal assumption, however, is based on an antiquated, arbitrary and purely fictitious separation into single volitions and acts of the individual's attitude to his fellows in the community. The mental condition characterisctic of intoxication and the criminal or disorderly act committed under its influence are the elements chopped off by the legal theorist as the only ones legally determining guilt or non-guilt. In reality, as realities must be reckoned in the psychology of crime, this status of legality is in itself a factor which makes for criminal acts by catering to irresponsible conduct. In the armies and in those few commonwealths where intoxication is no excuse even drunken persons learn to restrain themselves and to refrain from such acts as that of driving an altomobile or firing a gun at random. Legally as well as psychologically the mental condition of the man who gets intoxicated in any degree and in this state violates the peace of the traffic or commits a crime in which the automobile is an accessory may with better logic be reckoned from the time when he began to drink alcohol while knowing or in a position to know that he would or might be called upon and would or might choose to drive an automobile shortly thereafter. At no age has a man been held excusable for ignorance.

The continuity of the human mind and volition with relation to the problems of civilization is fully recognized where property is involved and in other matters which have had consideration during more than one generation. The misdemeanor of carrying concealed weapons is mainly based on the psychological fact that the man who provides himself with a weapon brings about a situation in which crime becomes more probable than is desired, and that the concealment of the weapon further aggravates these probabilities by taking others off their guard. Intoxication of the driver may very well be considered as the transformation of an automobile into a murderous weapon and at the same time as a concealment of this transformation, since the intoxication is not visible at a distance or without close inspection. Punishable neglect to provide the legally prescribed precautions against fire in cities is in the same class as the crime of laying the foundation for traffic disturbance, or worse, by the consumption of alcohol. Examples may be multiplied indefinitely.

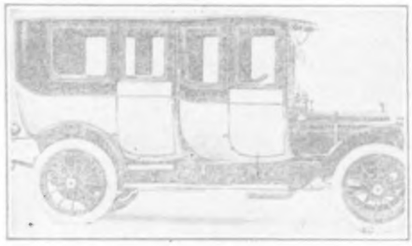


PIERCE-ARROW, MODEL "48-T"

Price	$5,000
Type of body	Touring
Seats	7
Wheelbase	134½
Tread	56
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	6
Method of casting cylinders	Pairs
Bore and stroke	4½x5½
Horsepower (A. L. A. M.)	48.6
Ignition	High-tension
Type of carbureter	Pierce-Arrow
Method of lubrication	Circulating
Type of clutch	Cone
Transmission	4-speed selective
Drive	Shaft
Front tire equipment	36x4½
Rear tire equipment	37x5

The present condition suffers moreover from the great practical difficulties in establishing satisfactory proof of intoxication or its degree, while a legal status under which an offensive act is judged wholly without reference to the mental condition in which the driver has placed himself before its commission would greatly simplify prosecution as well as greatly restrain the reckless individual's abandonment of himself to impulses which clash with the requirements for law and order in the highly dynamic and highstrung conditions of modern civilization and traffic. That these conditions, in which the automobile

is a very important factor, calls for a revision of the individual's attitude to possibilities and chances for injuring the tranquility, lives and properties of others seems to be the principle which needs to be firmly established—quite as much as such self-evident principles as "honesty in office" or the "conservation of the natural resources"—and a commission of specialists, comprising in this case men of affairs and science, eminent jurists and representatives of physiological and psychological knowledge as well as experts on construction and operation of automobiles, would find little difficulty in reconciling the principle with the dictates of the public conscience and of expedience. The work of such a preliminary commission once done, as it might be in less than one year, it seems, the task of legally safeguarding the principles enunciated by it would become a matter of legislation, the latter to be furthermore reinforced by judicial decision. But it is plain that the formulation of an otherwise acceptable uniform automobile traffic law need not await the delays incidental to the final acceptance of the simple principle of the "Continuity of Mental Responsibility," though this principle ought to be as clear now as the principle of the continuity of causes and effects in general. Whenever the disculpating effect of intoxication shall have been abrogated in law and public opinion, the new status will simply come as a new and strong force making for justice and common sense in the enforcement of previously enacted laws.



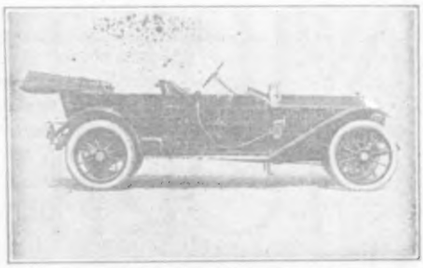
PACKARD, MODEL "30"

Price	$5,650
Type of body	Fore-door limousine
Seats	7
Wheelbase	123½
Tread	56½
Type of motor	4-cycle
How cooled	Centrifugal pump
Number of cylinders	4
Method of casting cylinders	Pairs
Bore and stroke	5x5½
Horsepower (A. L. A. M.)	40
Ignition	High-tension
Type of carbureter	Packard
Method of lubrication	Circulating
Type of clutch	Plate
Transmission	3-speed selective
Drive	Shaft
Front tire equipment	36x4½
Rear tire equipment	36x4½

Some time might be gained if the principle were acknowledged with reference to automobiles alone, at first—which seems to be a possibility under American institutions—while criminal and civic procedure in general would await a broader and more popular ratification of the same principle. In that case, it would be to the credit of the automobile and automobilists to have shown the way to an important advancement in civilization, outside of the field of engineering and mechanics.

(3) Permanent deficiencies in the driver. In Germany the new national automobile law specifies that those whose eyesight, under a certain prescribed test, "falls below two-thirds of perfection" shall not be licensed to drive automobiles, and a very large number of automobile owners whose eyes have been crippled in the State schools, so that they are practically compelled to wear spectacles, are thereby excluded from driving their own cars. The hardship incidental to this provision is acting to nullify it through slack enforcement, although the correctness of the principle involved is generally acknowledged. The example suggests a viewpoint from which the hardship may be avoided without infraction of the principle. It behooves those whose sight or hearing is deficient or whose nervous or muscular constitution renders quick and suitable action in emergencies improbable, to observe at all times such special caution as should be observed by all under special conditions, as when the vision is obstructed by fog, darkness, buildings, hedges, etc., or when sounds are drowned in deafening noise, or when the road surface is slippery. It might be provided that in case of traffic trouble and ensuing legal proceedings the fitness of the drivers involved should be inquired into under certain prescribed and simple rules, and in case a driver under such circumstances is found to be afflicted with some form of permanent deficiency, his responsibility should be determined with reference to the extra degree of caution which may properly and justly be demanded of him. That no one subject to epileptic fits or other grave defects should be allowed to drive automobiles goes perhaps without saying, and this exclusion could be covered legally through declaration of the principle rather than by an enumeration of specific defects, which might after all not prove to be exhaustive.

(4) Peculiarities of automobiles affecting the driver's actions and faculties. This is disputed ground. Mechanics and physiology are both deeply involved. A fact which throws light upon it and which is also somewhat generally known and credited is the more moderate and considerate driving which is characteristic of steam vehicles and drivers of steam vehicles, as compared with gasoline vehicles and drivers of gasoline vehicles. Some inquiry into this alleged fact would apparently be in order. If it is found to be well substantiated it should give practical support to a reasoning which, however, stands very well without it.



PEERLESS, MODEL "32"

Price	$6,000
Type of body	Torpedo
Seats	4
Wheelbase	136
Tread	56
Type of motor	4-cycle
How cooled	Geardu
Number of cylinders	6
Method of casting cylinders	Pairs
Bore and stroke	5x5½
Horsepower (A. L. A. M.)	60
Ignition	High-tension
Type of carbureter	Peerless
Method of lubrication	Circulating
Type of clutch	Expanding-band
Transmission	4-speed selective
Drive	Shaft
Front tire equipment	36x4½
Rear tire equipment	37x5

The characteristics of the control of steam vehicles reside in the very slight physical effort required for either acceleration or retardation, due to the range of the throttle control and to the natural action of the engine as a brake. Compared with this easy wide-range control, the composite operation of throttle, spark, clutch, gear shift, service brake and emergency brake constitutes in practice a powerful encouragement for trying to "get by" without any other control movements than those required for steering, very dexterous steering. The physical and mental effort for combining the control elements properly in each instance draws upon the wide-awakeness of concentration of the average person at a rate which the average person is not at all times ready to honor. While a system of braking by means of the exhaust gas has been installed successfully for driving in mountainous regions, with a view to use only on the down grades, the fact that an internal combustion engine is liable to be stopped completely when the same method is used, without nice discrimination, on level roads or streets, militates against its general adoption. Practical development has gone in the direction of perfecting the clutch. But the clutch alone does not affect the momentum of the car. Much less has been done for imparting to the brakes all the qualities which would make brake action easy to the driver and wholly acceptable as the normal means for slowing up a car, whether roads are firm or slippery and whether the required retardation should be small or severe. Much has been done for perfecting throttle control, but this, too, has either no effect on momentum or it disturbs the motor functions, and mechanical difficulties are presented.

WHAT THE YEAR BRINGS FORTH MECHANICALLY

WITH so many automobiles to be examined within the space of fourteen days, the average automobilist must have difficulty in discerning the newer ideas, and in order to be able to appreciate the real advances of the year in a mechanical way, it has been considered desirable to have the various automobiles examined critically by an expert, and to utilize the camera for what it is worth in the presentation of the material thus uncovered. Some of these new ideas were taken from the automobiles as they were presented at the Palace Show, while a considerable number are representative of the cars in the A. L. A. M. group as they were exposed to view at the Garden.

Despite the fact that the automobile has had the benefit of five years of pioneering and ten years of steady evolution at the hands of men who have embraced it as their life's work, the field of endeavor has not been exhausted by any means, and crystallized ideas are coming to the front with the greatest regularity. Moreover, the mechanical expression which is being given to these new ideas is more sharply defined, and the style of design of the details throughout the cars this year is that which can be recommended as the exponent of mature deliberation and purity of thought.

There are some things which the camera cannot show; take for illustration, the use of cast gray iron instead of aluminum in crankcase work; the movement is far-reaching, and the considerable number of the automobiles, or rather the makes of cars, that came to New York a year ago fitted out with aluminum crankcases, were revamped in cast gray iron for this year, and the reasons why this important change should be made are sufficiently good to command the attention of serious thinking men. Aluminum is a vastly more expensive product than gray iron; then again, gray iron is probably stronger by at least 100 per cent.; moreover, the time required to procure gray iron from the foundry is probably relatively short, and it may be said, too, there is a certain uniformity in the production of gray iron that does not seem to attend that of the other product.

The time was when the users of automobiles would have stepped in and in their dictatorial way would have indicated their displeasure at any movement that would have for its basis the lowering of the cost of production if it resulted in the elimination of any of their favorite brands of material. They would have said, "give us aluminum," or they would have indicated that cast iron was too cheap and let it be added, too good for them.

A cursory examination of the new products of the year as they were seen in the various plants ere they came to the show indicated most clearly that makers of automobiles are coming to their senses, and let it be said that they are not being dictated to by faddists to anything like the extent they were in the past. Cast gray iron has a minimum tensile strength of 18,000 pounds per square inch, and under well-regulated foundry conditions an extra 10,000 pounds per square inch may be readily obtained; nor is it too much to claim that the possibility for tensility above 28,000 pounds per square inch is not exhausted at a figure below 35,000 pounds per square inch.

Just what may be claimed for aluminum in the matter of tensile strength and other desirable physical properties is a matter which will have to be settled at a time when substantial guarantees may be had from those who are in a position to do so, but the information available at this time does not permit of making a statement, but it will suffice for the present to call attention to the increasing presence of gray iron in motor cases and other like parts, which, however, is not to be inferred as indicating that aluminum is going out.

The Explosion Motor is Coming to the Fore

Granted that the present type of four-cycle motor, as it is used in automobile work, is technically known as the "constant-volume motor," the fact remains that it is of this description in name only, due to the practice heretofore of putting up with an indifferent degree of scavenging, and assuming that one spark, more or less efficacious, no doubt, would suffice for the purpose, but manograph cards have invariably indicated that the burning of the gas continues after the piston starts on its outward migration, and to whatever extent this burning is continued beyond the dwell point, it defeats the right to designate the motor as being of the constant-volume type.

The most recent investigations of the subject of ignition have borne proof, and elucidated an earlier idea, which had for its foundation the fact that if a fire is started in a plurality of zones of a combustible, the time required to burn the combustible will be reduced enormously. The old idea of igniting the gas at one point without being particular as to the efficacy of the location and the quality of the gas therein residing is being supplanted in order to take advantage of the theory which has for its foundation the fact that a fire must be "kindled," and that the quality of the fuel composing the kindling material must be more appropriate than the quality of the main body of the fuel. It is also being recognized that the location of the kindling material, with

respect to the main body of the fuel, must be carefully regulated for the best result, and relatively recent experiments have clearly indicated that the rate of flame travel in the body of a more or less incomplete gaseous mixture is really too slow in view of the improvements which have been wrought structurally in automobile motors.

Even last year motors were not sufficiently well designed to permit engineers to take advantage of piston velocities beyond 1,000 feet per minute, due to the fact that the secondary moments were augmented as the square of the speed, and they were in the uncoupled relation to a sufficient extent to defeat attempts to take advantage of more perfect combustion conditions, considering the increase in speed and torque that is now being regarded as good practice. It is undoubtedly true that the more perfect methods that are being used to ignite the mixture are having a marked bearing upon the power for displacement, and the thermal efficiency of performance as well.

These gains, which are really brought about by taking advantage of the explosion principle which results in the satisfaction of the constant-volume motor idea to a far greater extent than has been true in the past, are bringing into play a cluster of considerations which are having the serious attention of the more advanced designers, and which will be brought forcibly to the notice of those who overlook a few plain facts. Cylinders that have been designed on the old basis, when they are put to work under substantially detonating conditions, will go asunder if they are so poorly designed that they barely withstand the pressures when the mixture is ignited at one point, particularly if the same is so diluted with spent products of combustion that it is relatively slow burning, and somewhat soft in the blow that it strikes. The days of the "trip-hammer blow" of the detonating mixture within the combustion chamber of the cylinders of motors are quite near now, if it may be assumed that the more strenuous practice is not general, and among the things that must be looked after with the utmost care are the cylinders, not only from the point of view of design, but with respect to the quality of the material.

If we are coming to the "explosion" motor, it is also true that account must be taken of the extra work that the crankshafts will have to do, and that it will be possible to increase the torsion on the crankshaft of a motor without increasing the responsibility of the bearings is, of course, not to be taken for granted, but if extra duty is imposed upon these members, certainly the relating members will have to bear a burden that must be regarded as greatly in excess of that to which they would fall heir under the older conditions.

The Old Empirical Formula is Being Upset

More light, as it is being cast upon the problems of the day, brings forth the promise of more power than the empirical formula which has passed current would seem to indicate, and the increase in power for displacement is very marked indeed. But since automobilists do not require more power than they have been utilizing, it remains to reduce the bore of the cylinders of the motors so that there is a promise of an extra dividend in the shape of a reduction in weight, the lowering of the twisting moment when motors are pulling their heaviest loads, and a distinct series of gains in the direction of a decrease in the rate of depreciation of automobiles.

There will be some difficulty in convincing automobilists that they will be able to get from say a 4 x 4-inch bore and stroke respectively, four-cylinder motor all the power that they may require for a given chassis in the face of the fact that heretofore they may have failed to realize a sufficiency of power, using motors of a considerably larger size. The automobilist who gets in the way of progress along these lines will be in a position of the fellow whose curiosity impelled him to try his finger on the buzz-saw; the newer motor of smaller size will be a better performer in every way than some of its ancestors, although the seriously discommoding torquing moments which are the products of large motors at low speeds will be absent. All these, and many other things, are being given marked attention on the part of engineers, and with these matters in mind, remembering that they cannot well be illustrated, it will be to the point to go over the illustrations and the descriptive matter relating to them, which are intended in this instance to convey a conservative impression of the advances that were made in a twelve-mouth.

At the Grand Central Palace Show

At the automobile show of the independent manufacturers held in the Grand Central Palace a number of models made by concerns new in the business were prominent. There were also some striking novelties. The Cyclonette, a German-built tricar, was shown. This little package wagon was driven by a motor directly over the front wheel, this wheel being used for both steering and traction. Between the two rear wheels the package box was mounted. The Only car was another of the novelties. In this machine a single-cylinder vertical engine of 5 1-8-inch bore by 10-inch stroke was used. The flywheels were enclosed in the crankcase. The car looked quite unusual. A very interesting tricar was exhibited under the name Motorette. In this machine the rear wheel alone did the driving, while the front resembled a car of more nearly standard construction. To secure stability the front axle was forced by means of a cross tube and suitable linkwork to maintain a position always parallel with the body. A two-cylinder opposed two-cycle engine of 3 1-4-inch bore and 3 3-4-inch stroke furnished the power. This engine uses a hollow crankshaft as intake pipe and rotary valve, by means of a port cut through a bearing. The machine shows much careful thought, and its future will probably prove interesting; it is being marketed at $385.

Another novelty was exhibited by the Metz Company. This was a double-runner sled driven by a fan. An air-cooled engine supplied the energy, and the brakes were sprags that could be dug into the ice by pressure of the driver's foot.

Many interesting detail designs were discovered. As most of the cars exhibited belonged to the moderate priced class, considerable skill had been employed to achieve results at a minimum of expense. It is in matters such as these that designing ability becomes most necessary, since the moderate priced cars are usually turned out in the largest quantities, and any economy effected is multiplied from one to ten thousand times in duplicate production. The lower the price of the car the higher the grade of designing ability necessary. Although this truth is almost obvious, several concerns have not yet come to realize it.

On the Lion car several evidences of thoughtful and good design were discovered, as shown in Fig. 1. The inlet manifold on its inner side carried an integral lug, some 3 1-2 inches long, in which were placed four fiber bushings through which the high-tension wires passed to the spark plugs. The high-tension wiring on this car had been well cared for, since the conductors in their run from magneto to plugs were strung like well-ordered cables in a power house.

On the Lion car, as shown in Fig. 2, was also found a combination crankcase, oil filler, breather tube and fan support. As an oil filler this design was excellent, and considered either as a breather tube or fan support it was just as good. On the top of the cam gearcase a cast aluminum standpipe was fixed. To have this serve as an oil filler the mushroom-shaped cap was unscrewed, and an ample opening was uncovered. As the screw of the cover cap was of smaller diameter by about 1 inch than the inside diameter of the standpine a ring was left around the tapped part, and some openings were cored in this ring. As the cap when tightened could not close these "breather" holes the crankcase was relieved of any pressure, and as the cap extended

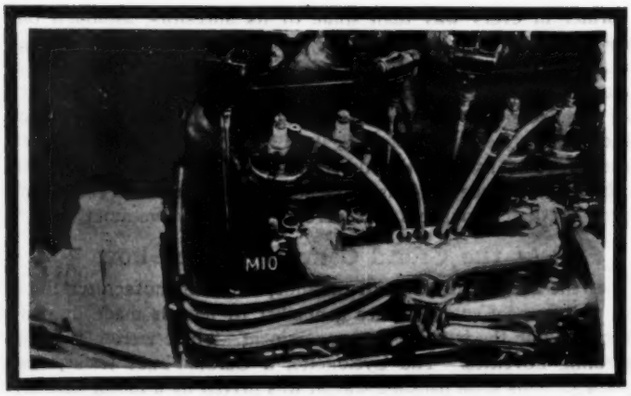


Fig. 1—Wire support on Lion car

beyond the holes there was no danger of dirt getting into the gearcase. For supporting the fan two lugs had been cast in the side of the standpipe, and through these lugs a pin passed to act as fulcrum for a bell crank actually carrying the fan bearing. Adjustment was secured for the fan belt by a long set screw passing entirely through the standpipe, which pushed on the lower end of the bell crank lever. This design made it most convenient to pour oil into the gearcase, and so into the crankcase, and the adjusting of the fan was a matter of some two minutes' work.

One of the best things from a sales and utility viewpoint seen at the show was the aluminum front door frame used on a Velie touring car, as shown in Fig. 3. While most purchasers seem to desire the fore-door type of body, there are many who fear that the front doors may make a car uncomfortably warm in Summer, and are, therefore, undecided as to just what to buy. Very wisely in the construction mentioned all argument is forestalled. An aluminum frame, which does not look at all like an afterthought or an attachment, carries the front door, and fills the space between front seat panel and dashboard. When desirable this entire frame comes out by the removal of some screws, and the body is converted from fore-door to the regular type. One little detail also attracted on this car. As shown in Fig. 4, the oil sight feed glass on the dashboard has been placed at an angle of about 45 degrees, so that the oil was plainly visible from the driver's seat. The dashboard itself presented a clean appearance, which goes to make a good impression both on those who know about motor cars and those who do not. The only objects appearing on the dashboard were the oil sight feed and the Atwater-Kent switch. This switch, by the way, made a mute

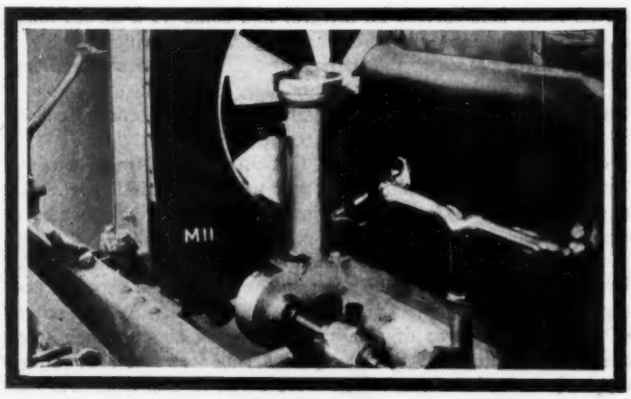


Fig. 2—Combination crankcase oil filler and fan support on Lion car

"appeal to reason," for the "off" position was at one end of the throw. In an emergency it is a great thing not to have a switch with "off" in the central position, for the chances of pushing the lever beyond are too great, and disaster can so easily follow.

On the Bergdoll, as shown in Fig. 5, the front end of the rear axle torque member was supported in a sliding type of ball and socket joint. On the forward end of the tubes a forging had been fitted, which provided sockets for each of the tubes composing the torque member, and extended forward for some 6 inches as a shaft. This shaft passed through the center of the ball, which

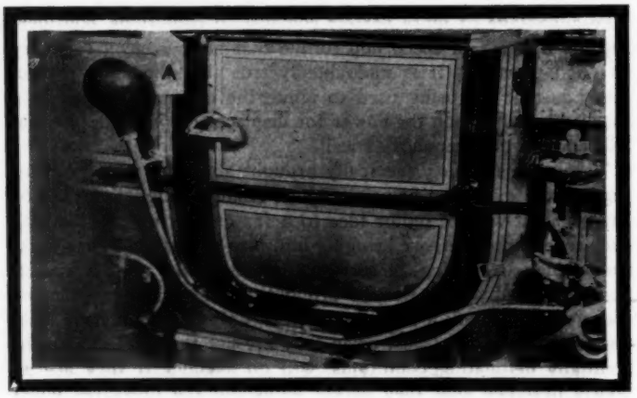


Fig. 3—Removable front door frame on Velie car (A shows where joint is made)

was in turn socketed in a hanger from a frame cross-member. It will be seen that this joint gives complete freedom of movement in all necessary or desirable directions. The absence of a spring type of "buffer" is worthy of comment. If the Bergdoll is able to use this simpler construction with success, the question arises as to why so many others continue to make something so much more complicated. At the exhibit of foreign cars last year,

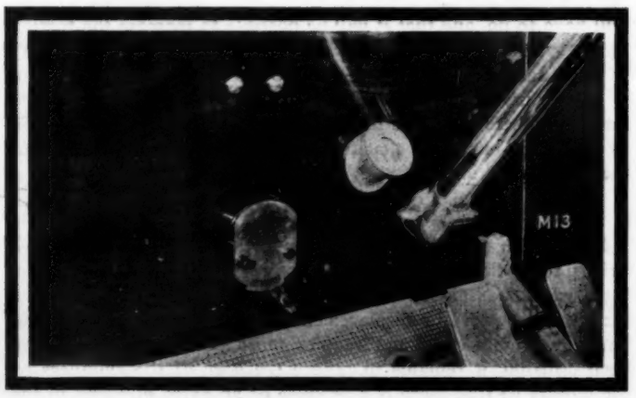


Fig. 4—Velie dashboard "a clean job"

it was noticed that one of the best of the European models had dispensed with any arrangement of springs.

The Model X Henry car, as shown in Fig. 6, had quite an innovation in the matter of tool box. On the right-hand running board two cabinets of drawers and compartments were built, and here, grouped all together, were tools, inner tubes, storage battery and Prest-O-lite tank. On this model the side lamps were placed on a line with the backs of the front seats, which in runabout models is attractive. The head lamps, dashboard lamps and side lamps were arranged on practically a straight line, so that at night they would seem to be equally spaced vertically.

The Firestone-Columbus furnishes the left-hand drive as standard, although giving right-hand drive on request. On the four-passenger, fore-door model, with left-hand drive and central control, this company has provided a coupé body which is interchangeable with the touring body. The advantage of a central control in an inside driven body is that easy access is given to either door, and in the matter of body building it is unnecessary to spoil the lines of the side panels to enclose control levers, which project beyond the frame line on the right. It is rather remarkable that more automobile concerns have not followed this practice, for the time is fast passing when a man will be content to store his car during the colder months. He will and should expect to be kept physically comfortable for all-the-year driving, and the selling of interchangeable coupé bodies would form an additional source of revenue to manufacturers.

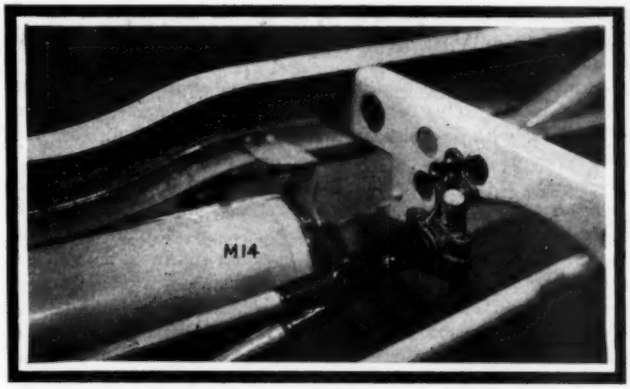


Fig. 5—Bergdoll torque connection

The Johnson car, a product of the Johnson Service Company, had several original features. One of these was a running-board made up of 5-8 x 1 1-8-inch wooden strips, running lengthwise of the car. These strips were separated one-half inch by tubular spacers, and bolts, passing through both strips and tubes, held the whole together. On the 5-8-inch top of the strips 1-2-inch round brass was attached by wood screws. The most novel feature seen on this car, however, was a spiral spring of the clock spring type, which was used to secure a sudden movement of the magneto armature when cranking the motor. This spring arrangement was in a barrel casing just in front of the magneto coupling. It was provided with a cam type of release which let the spring "kick" the magneto over quickly to get the hot spark in starting. It was understood that this device will later be marketed by the Johnson company. As shown in Fig. 7, the oiling system on the engine of this car was most simple. The entire oil pump comes off with the oil pan, and there is no piping for the distribution of oil. The crankcase oil pan has proper distribution grooves cast in it so that oil is distributed to the four compartments. Holes are drilled through the aluminum to carry the oil up to these grooves. The oil pump itself is cam operated and is of the plunger type.

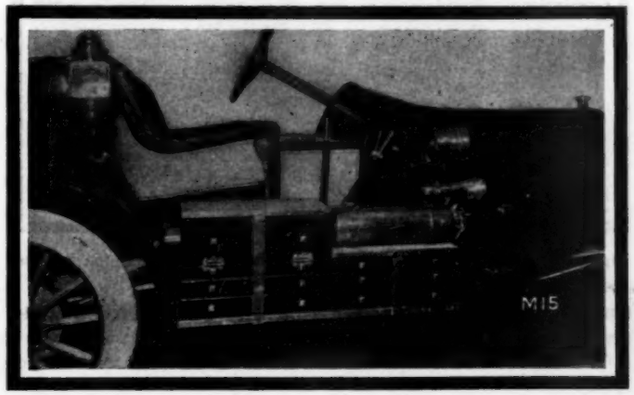


Fig. 6—Tool boxes and inner tube and battery box on Henry car

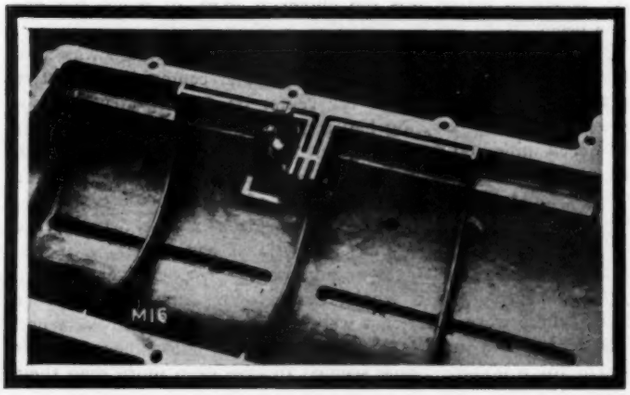


Fig. 7—Oiling system on Johnson car distributing grooves cast in oil pan

The modern tendency to cover the valve springs, tappets, etc., has been carried out in the Cole "30" in a very complete manner. This car also showed the refinement of a trunnion type of radiator support.

On the Imperial car appeared a little refinement by way of a junction cover where a three-wire braided cable branched into the three separate wires which had been covered as one. This junction was made of brass and essentially consisted of a sleeve fitting over the large cable, with three small brass tubes arranged fanwise for leading out the individual wires.

The use of exposed rocker arms for operating overhead valves has, from time to time, been rather severely criticised. On the Cunningham (as shown in Fig. 8), which is a newcomer in the field, although made by an old company, the rocker arms have been completely encased in housings of cast aluminum. The valve tappets operate through bushings in the aluminum casings.

A rather novel rear spring suspension was seen on the Krit, as shown in Fig. 9. One rear spring only was used, and this was, of course, arranged across the car. Connection to the rear frame cross member was obtained by using a hinged spring seat, which allowed the rear axle to swing on the true arc fixed by the radius rods. As the radius rods were brought together in front.

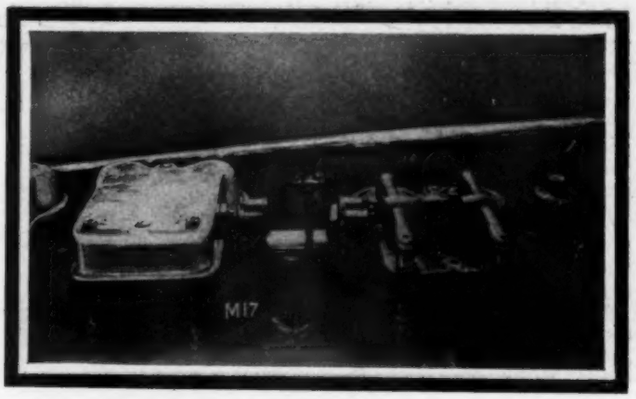


Fig. 8—Cunningham valve rocker covers

the center of action was the universal joint, of which but one was used.

An Oldham coupling out of the usual run of design was used on the Penn motor. Instead of the regular center disc with two grooves cut straight across the center 90 degrees apart on opposite sides, this coupling had a center disc in which four slots had been milled 90 degrees apart. As these slots were about 5-16 inch wide and 3-8 inch deep, the projections that engaged were made almost square. The advantage of this design would seem to be that it is more easily made, and that it is shorter by the height of one of the driving projections than the standard design. Its very compactness would often prove advantageous.

In considering, as a whole, the pleasure cars of the Palace Show, there were many that were good, and some that were not. The better cars in most cases gave a large and honest dollar's worth for a dollar. Some seemed to give even more than their price in value. On most of the cars there was nothing that offended the eye of a designer, while on a few crudities had been permitted to appear which indicated a lack of engineering experience and familiarity with modern automobile design.

Such novelties as the Motorette tricar, since they indicate that thoughtful originality is still being exercised in the field of motor car design, are useful, not only intrinsically, but because they furnish mental stimulation.

The influx of original and new brains is desirable in any industry, and particularly one that has such fields of future development as the automobile business.

Seen at the Madison Square Garden Show

To the skilled automobilist, as well as to the automobile engineer, the show in Madison Square Garden gave the assurance that no better cars can be found the world over than some exhibited there. The first impression was that many models had been radically altered since last year, but this was due to the sweeping changes in body design. The fore-door body, without a question, is leading in popular favor. The limousine is also undergoing an evolution, and present designs seem to give promise that the day is almost at hand when both the driver and passengers of these luxurious closed cars can be decently comfortable. It is amazing, for example, that every closed car is not regularly equipped with a heater. This condition of things brings to mind the early days of street cars, when paternally inclined street car magnates felt that heated cars would be unhealthy. The fore-door limousine is now up to date with the street car having a vestibule front. Surely the alert manufacturer of automobiles will have no "ill health theory" that will make him tardy in supplying some such device. While there were many novelties in body design, the chassis gave the appearance of 1910, so few were the noticeable alterations. No new valve mechanisms were noticed, although there was a great variation in the location of the valves themselves. Those who have in the past few years used the valves in the head seem quite well satisfied with their practice, particularly as this construction conduces to excellent efficiency in "miles per gallon," but the users of T-head engines feel that the advantages of this type outweigh the disadvantages. As the price of gasoline advances this subject will become of much greater interest.

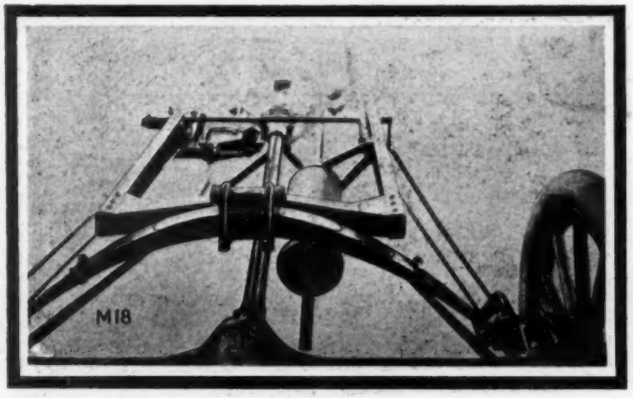


Fig. 9 –Rear spring suspension on Krit

It is worthy of interest that the majority of camshaft engine gears are now made with the teeth at an angle, helical gears, as they say. The "herring-bone" or double helical was seen on only one car at the show and seems to be marked for total extinction.

A most interesting camshaft drive was seen on the smaller Jackson model. This car uses a valve-in-head engine, as shown in Fig. 11, with a camshaft that passes along the tops of the cylinders. Instead of driving this camshaft with two sets of bevel gears and a vertical shaft, a silent chain is used, with two sprockets. This silent chain drive has been used to some extent abroad, but is slow in making its appearance here. For operating an overhead camshaft the Jackson construction approaches the ideal for both simplicity and silence. A new construction that was seen on almost all of the recently designed motors, such as the "Hudson 33" and the White, Model G. E., was the complete enclosure of the valve springs and valve operating mechanisms. (See Figs. 12 and 13.) This design, at the expense of some six parts (two covers, two wing nuts and two studs) assists very much in giving an appearance of simplicity, and, while in general the addition of parts does not seem justified except when adding luxury, the complication of these cover plates promises to pay for itself in longer life of valve

Fig. 10—Dashboard tool box on the Johnson, giving quick access to the tools usually required

tappets and valve stems. The Hotchkiss also offered a well-designed example of this construction.

One case of additional mechanism that needs no argument to justify its existence is the power tire pump. The Pierce-Arrow used a power tire pump (Fig. 14) as standard equipment last year, the pump being purchased on the open market. This year a new pump of Pierce-Arrow manufacture made its appearance. The Peerless chassis also showed a small four-cylinder pump attached to the forward end of the transmission countershaft, as shown in Fig. 15, and the new model Autocar, selling at $2,350, with fore-door body, had a tire pump as part of its standard equipment, as given in Fig. 16. One of the most ludicrous sights in the world is to see a man who is capable of developing about one-tenth of one horsepower become red of face and steaming warm of body in working a tire pump while an engine able to develop, let us say, some thirty or forty horse-

power rests peacefully under the hood. Man's strong point is most assuredly not his ability to do mechanical work, and as civilization has advanced so has the use of power. It is safe to assume, with history as the guide, that the motor cars of five years hence will be universally equipped with power pumping, except where the very low price of a particular car may make this improvement appear a luxury.

Most of the makers seem to be wide awake enough in providing many small conveniences, although some seem to be so much affected with mental inertia that they cannot learn from a competitor.

On the Packard touring car a wind shield of most excellent design was found, and illustrated in Fig. 17. Instead of having the upper glass pivoted in the middle, as is usual construction, the Packard glass was swung from the top. On a cold, rainy day the ordinary front lets wind and some rain come between the

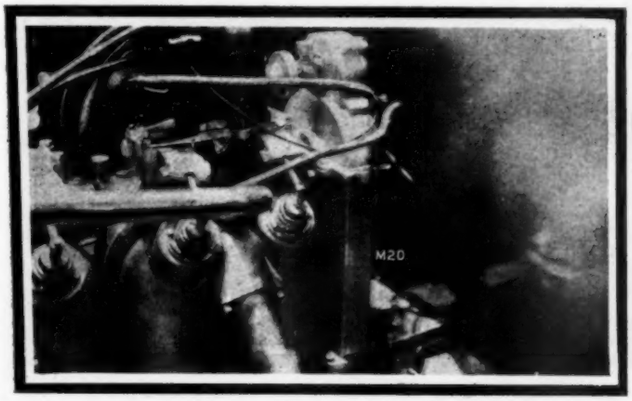


Fig. 11—Silent chain drive for overhead camshaft on Jackson

top and the upper part of the glass front, since it is usually necessary to tilt the upper glass to get a good view of the road. With Packard construction no gap is left between glass front and top. This front was not only cleverly and sturdily designed, but was built right. The Packard inside-driven coupé should appeal to the man who wants to drive all Winter and yet insists on being comfortable.

At the Thomas exhibit some beautiful bodies were shown on the Six-Forty chassis. It was learned that this company is prepared to furnish a two-cylinder vertical power tire pump as extra equipment.

On the Oldsmobile were two features that should be of some value to salesmen in merchandising, the running board tool and Prest-O-Lite tank, boxes and a radiator mud shield (see Fig. 18). The tool boxes occupy the space between the frame sides and the inner edges of the running boards, while the mud shield for the radiator is a piece of sheet steel, some eight inches wide, placed horizontally and running from frame side to frame side (see Fig. 19). There must be many who have, when driving on muddy days, made frequent undesired stops to wash out the radiator fins or tubes.

The car which shows a really radical change from last year is the Franklin. By the use of a "sirocco" blower, directly attached to the rim of the flywheel, the current of air handled is proportional to the engine speed. The cylinders are now provided with vertically arranged fins of sheet metal, cast with the cylinder itself. Each cylinder, with its fins, is placed in the center of a "chimney" which is open at both ends. The upper end takes air that rushes into the Renault type hood, while the lower end is fastened to the top of a metal box, at the rear end of which the blower is busy expelling the air. As the only inlets for the air are the chimneys around the cylinders the

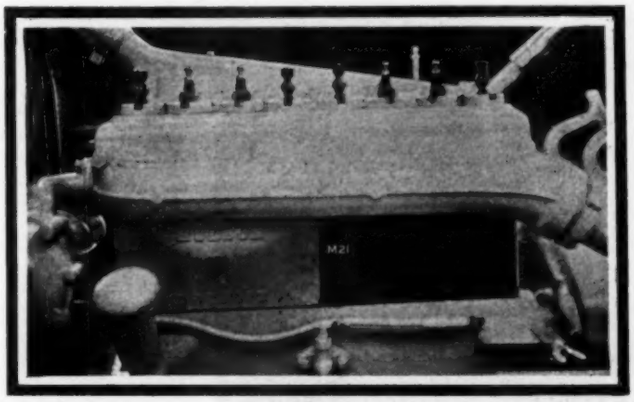


Fig. 12—Valve spring covers on the Hudson "33," showing one cover removed

circulation of air around each cylinder is quite positive and the cooling system is understood to be entirely effective. The substitution of the Renault, or sloping hood, for the cylindrical hood formerly used has done wonders to improve the appearance of this car, and one of the most attractive bodies at the show was on a Franklin chassis. Another improvement this year is the running of all electric lighting wires in tube conduits. Much of the electrical wiring on automobiles has been a disgrace to the industry. The dashboard electric lights and ventilator on the fore-door Franklins, as depicted in Fig. 20, are well worthy of attention. Two doors, with spring hinges, make it a matter of two seconds to admit or exclude air (see Fig. 21), while doors back of the dashboard lamps enable light to be thrown back onto the front seats.

On the Stoddard-Dayton running board tool boxes of neat design, as shown in Fig. 22, were provided, which, unlike the Oldsmobile type, consisted of boxes immediately under the running boards themselves.

On the Lozier the adjustment of one of the sets of brakes had been nicely cared for, as shown in Fig. 23. The adjuster itself consisted of a turnbuckle, to which was hinged, by a rivet, a U-shaped latch or holder that slipped down over the brake rod, which, adjacent to the turnbuckle, had been flattened on each side so that the U latch could prevent rotation.

While most cars using leather rebound straps trust to the strength of the leather alone to pull the axle up with the car and absorb the shock, the Elmore used a sprig attached to the leather strap, as shown in Fig. 24. This would certainly soften the action of the device and appears to have merit.

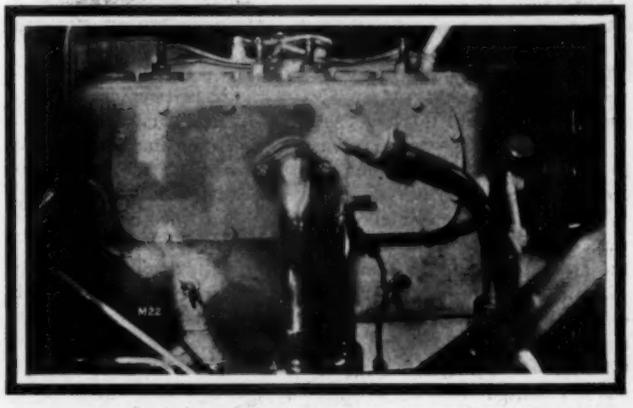


Fig. 13—Showing valve spring covers and bloc construction of the new White "G. E." model

The Locomobile presented the same clean lines that have for several years distinguished this car. The design of the clutch cover and of the cross clutch shaft and pedals was wonderfully fine in its simplicity, as indicated in Fig. 25. "Clean design" may not mean much to the average buyer of an automobile, but to the automobile engineer it means a great deal. If two cars could be put side by side, each representing the opposite type of design, the buyer could hardly fail to be struck by the difference between them. In the vernacular of the engineer, those parts which appear on a motor car without logical justification for their existence, are known as "junk." And "junk" is a sure indication of second-rate designing talent, or of a "penny wise" policy of some unskilled or ignorant manager. To the experienced it marks the bad car from the good. The tendency to-day is not only to design mechanisms that will work, but to have them clean of appearance and smooth of contour as well. And this tendency is most commendable.

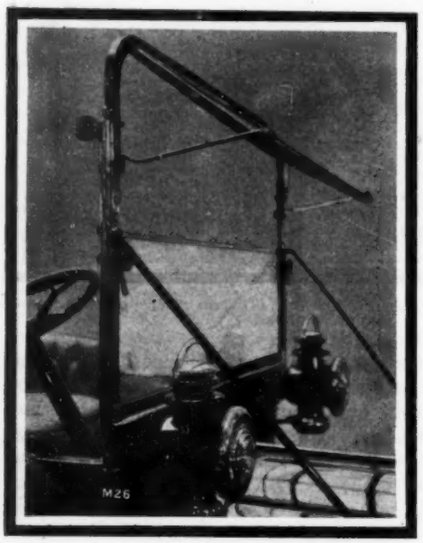


Fig. 17—Packard glass front, showing top portion hinging from above

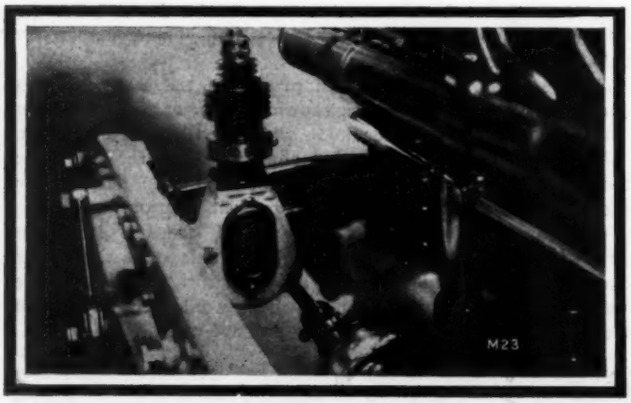


Fig. 14—Pierce-Arrow tire pump

The Winton this year continues the self-starting device that it has been using for the past year or two. The Winton starter obtains its power from the exploding charge in the cylinder. A suitable check valve allows a small part of the high-pressure charge to pass on to a tank. After the motor has run a short time this tank is completely filled with gas. At the rear end of the camshaft a rotary distributing valve is placed, operated, of course, by the camshaft so that the proper timing may be maintained. From the distributing valve tubes run to the separate cylinders. When it is desired to start the engine gas is admitted from the pressure tank to the distributing valve, and the pistons, in proper sequence, are forced down.

The Amplex, two-cycle, was another car that provided a self-starting device. In this case a rotary disc valve was used which was driven by a shaft in the oiler. It was stated that air pressure was obtained by a piston pump, operated by the explosion of the charge in the cylinder. A pressure tank of suitable capacity, arranged under the front floor board, stored the power required. This car was provided with a force-feed lubricator having a number of separate leads to various engine bearings. This lubricator, however, was quite out of the ordinary in that the supply of oil to all parts could be increased for hard running by operating a rod that extended through the dashboard, and gave on demand a proportionately greater supply of oil from each feed.

The new Hudson 33 chassis created a favorable impression on account of its simplicity of appearance. In the Hudson construction the gear box has two arms which extend forward and make connection with the rear arms of the crankcase. This results in a fixed alignment between engine and transmission and makes the three-point suspension easily possible.

Fig. 15—Four-cylinder power tire pump on Peerless. It is driven by the layshaft of the gear box

The Cadillac showed a new device that users are sure to appreciate. On the dashboard is a graduated disc that cannot be turned more than one revolution. This disc, through a shaft to the carbureter, controls the adjustment of the tension on the spring of the auxiliary air valve. This limited adjustment will enable little corrections to be made for varying atmospheric conditions, but has insufficient range to permit the inexperienced operator from throwing the carbureter out of adjustment.

The Everitt car had an engine of monobloc construction with cylinders and the upper half of the crankcase integral, as shown in Fig. 26. The manifolds were cast integral as well. This

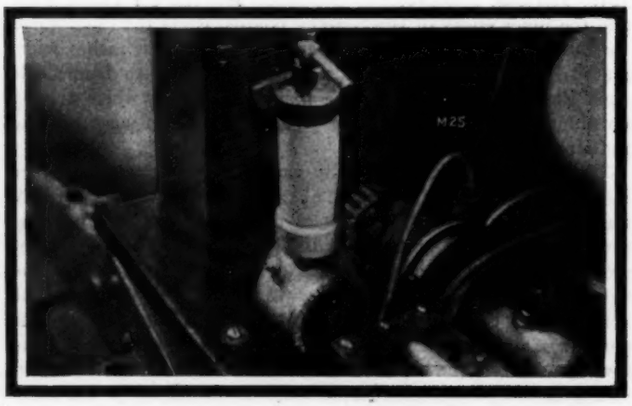


Fig. 16—Tire pump on Autocar

casting was an excellent example of good foundry work and resulted, to the motor car maker and user, in the elimination of some sixty to one hundred parts.

The Alco continues for 1911 its most convenient adjustment for both internal and external brakes, as shown in Fig. 27. The users of the Alco must appreciate the accessibility of this arrangement.

The Rainier motor, properly cut to show interior construction, was shown to excellent advantage on a tilting motor stand, as given in Fig. 28. It was learned that a stand of this same type is used at the factory in assembling.

A special model of the Speedwell car, of which some ten are being made, had carried out to the fullest extent possible the idea of mud protection for the radiator, as shown.

If any one word can be selected to tell the general trend of

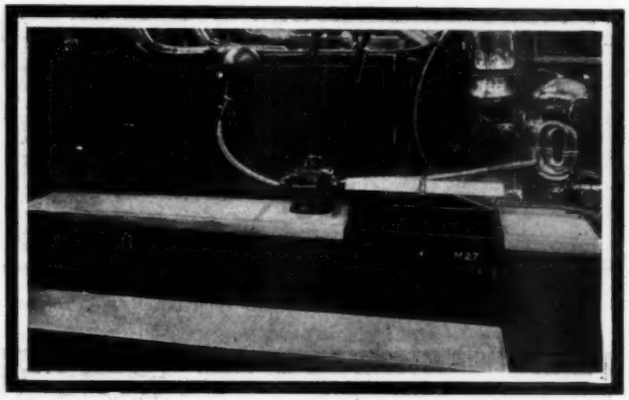


Fig. 18—Running board tool boxes on Oldsmobile

design, that word is "refinement." Passing from one car to another the impression is everywhere gained that the motor car makers are trying to do the little things well. The absence of freak designs and of radical changes indicate that the present day motor car has reached the position of commercial perfection.

What the Makers Are Doing

Ideas That Are Bringing About a Condition of Harmony of the Products

PROMISED advances, in the methods in vogue in the shops, have been made for the most part, due to the refinements

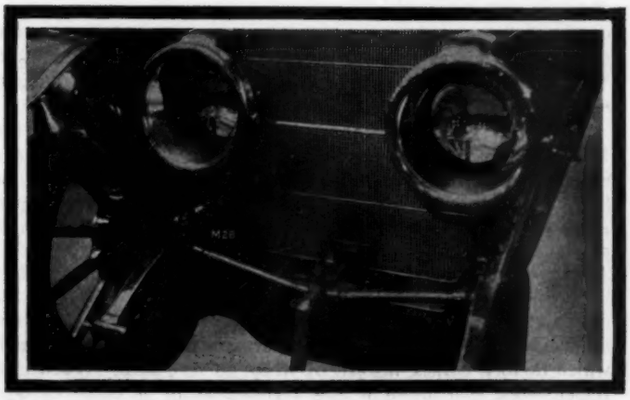


Fig. 19—Radiator mud shield on Oldsmobile

that machine tool builders have worked upon and brought to a state of great perfection. That the automobile has proven a boon to the makers of tools is agreed, but that the makers of machine tools have performed their task is also a settled fact. As an approximation of the situation as it stands, it is a reasonable claim that there are machine tools in actual use, devoted to the building of automobiles, on a basis as given in the tabulation on the following page.

Fig. 20—Dashboard ventilator and electric lamp on Franklin

The great question lies in having the truth known about the automobile business; to inculcate in the minds of the doubting Thomases, of whom there are quite a few, what it means to develop a business that gave to the makers of machine tools $6,448,000 worth of business per annum for ten years, paying out this vast sum of money in cash, even to the taking of discounts in a large measure. It is also worthy of note that this growth in the volume of trade of the makers of machine tools was in addition to the business that they were already doing, so it is believed, the

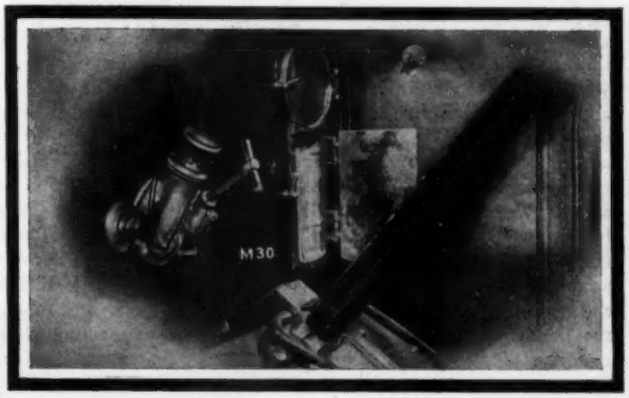


Fig. 21—Franklin showing ventilator door open and lamp door closed

proof of which lies in the fact that there has been no falling off in the breeding of horses, nor can it be shown that "wagons" are in any less demand than they were before.

There is no accounting for this relatively strange and profitable situation to the man who cannot be made to understand that the wants of a savage are few; comprising a simple "garment" and a "catch" for exterior and body wants. But as man becomes more the victim of the wiles of the civilized state, his wants increase, and, as has been plainly said, the more civilized man becomes, the more his wants are, and the more capable he becomes in the contriving of them.

What is most in need at the present time is a more complete

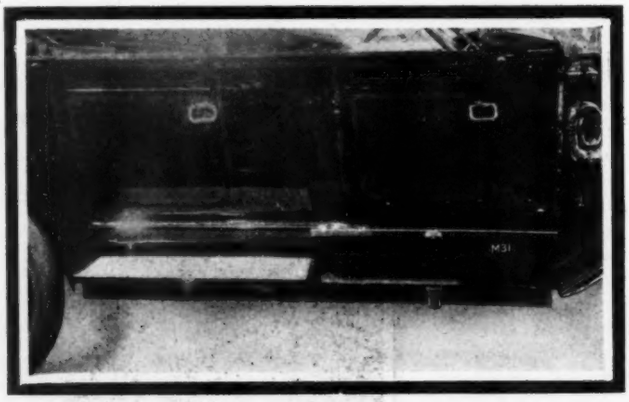


Fig. 22—Running board tool boxes on Stoddard-Dayton

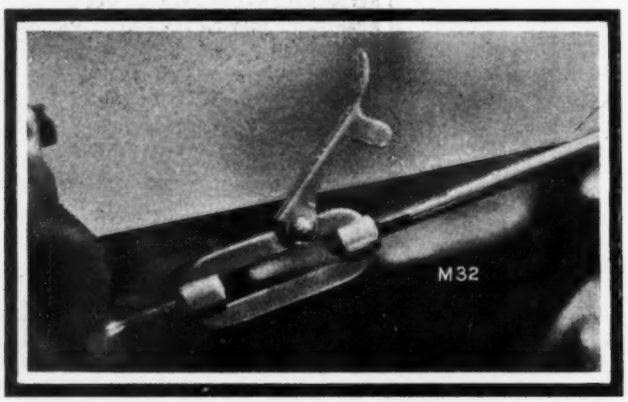


Fig. 23—Brake adjuster on Lozier; no wrench required

understanding of the fact that we are not to traverse back, down through the ages, to the state of savagery which knows no wants after the body is quaintly clothed and the stomach is appeased. Man is going right ahead with the process of civilization that seems to be the preferred environment of the majority, and, if it is true that some financiers labor under the impression that for the sake of variety, or to satisfy greed, there is to be a let-up in the manufacture of automobiles, how are they going to get away from the fact that nearly $65,000,000 worth of machine tools will be put out of use, and a large source of activity among the makers of these tools will be stifled? But if this is the situation among the makers of machine tools, how about the hundreds of other industries that are being maintained in anything but idleness? What of the 11,165 separate classes of business that draw upon the automobile business?

Nothing is to come of any wild talk about the business of making automobiles; it is here to stay. The reason lies in the

MONEY VALUE OF THE MACHINE TOOLS IN ACTUAL USE

Classes of Tools	Money Value
Various types of engine lathes	$17,375,000
Vertical boring mills	863,700
Turret lathes	4,200,000
Horizontal boring mills	1,030,000
Vertical milling machines	2,300,000
Cylinder boring and grinding machines	9,000,000
Special forms of milling machines	2,520,000
Drill presses	6,000,000
Special forms of crankshaft machines	2,000,000
Various forms of grinders	3,300,000
All sizes of screw machines	5,500,000
Forge and heat-treatment equipment	2,600,000
All forms of presses and tools for sheet-steel work	6,600,000
Total	$64,488,000

fact that the automobile is the willing servant of the more civilized man who lives in this year. That the man who wants an automobile is more civilized than the prehistoric individual who goes around with a pipe in his mouth while his wife totes the "laundry" home, balancing the same on the knob at the extremity of her neck, is not to be the subject of a long harangue, but it is not flattering to the vanity of the average citizen to have high and mighty exponents of this idea command the respect of listeners while this doctrine is being exploited. A story, with nothing better for a foundation, were it to be

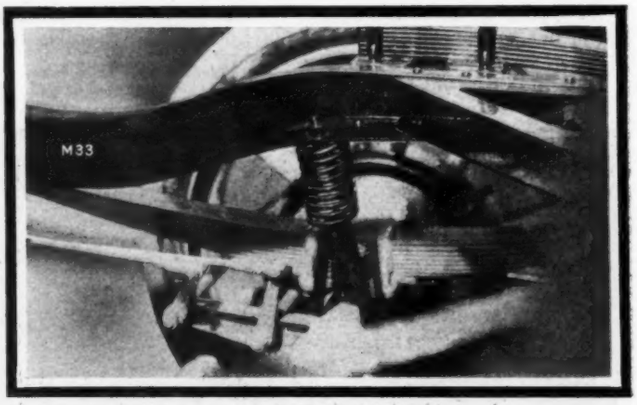


Fig. 24—Spring used in connection with rebound strap on Elmore

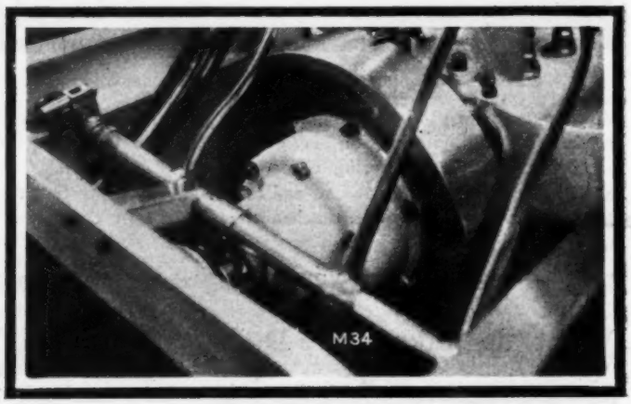


Fig. 25—Clean clutch design on the Locomobile

forwarded to the editor of a "great daily" by some ordinary individual, would go where it certainly belongs, but such stories do command space if the signature is "good." Fortunately, the signature, however good it may be so far as the editor of a "great daily" is concerned, is not worth the paper it is written upon when it comes to turning back the hands of time.

One of these fine days there is going to be a brisk demand for freight automobiles; a demand, in fine, that the plants that are now devoted to the building of passenger automobiles will not be in a position to meet, and, in addition to this relatively new requirement, there will be the automobiles that must be built for the replacement of horse-drawn vehicles.

Economic Value of Replacing the Horse

The price of wheat is high, and the value of bread is increased accordingly, due to the fact that farmers are raising oats with which to feed horses, instead of wheat to feed men. When it is remembered that there is the farm-effort of a value of $5,000,000 per day at present devoted to the raising of oats for

horse-feed, it remains to be seen that this large capacity for wheat, amounting to $1,735,000,000 per annum, will come into its own in the course of a few years when automobiles replace horses, as they surely will.

Dullards will say: "This will depress the wheat market and the present capacity for oats will be destroyed." They fail utterly to fall in with the doctrine of common sense; they do not know, nor can they be taught that as we learn more we earn more, and as we earn more, we need more. Take books, for illustration: What would be the use of them were we unable to read? There was a time when this was so. When books were made to fill a growing want, who will say that the want should have gone unsatisfied at the behest of those who were unable to read? What is the difference between the man who could not read a book a few years back and the individual who persists in believing that a change is not being made in our methods of transportation?

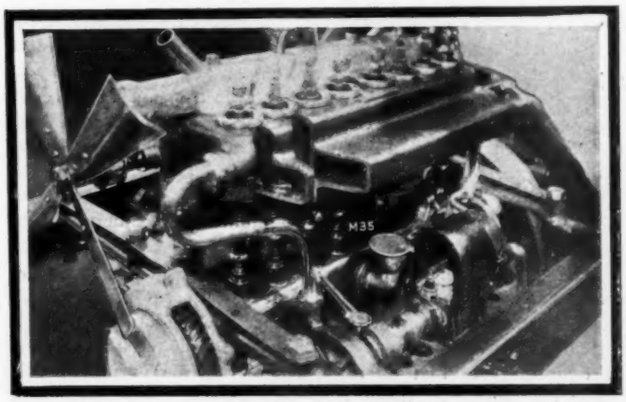


Fig. 26—The Everitt monobloc motor with upper half of crankcase cast integral with cylinders

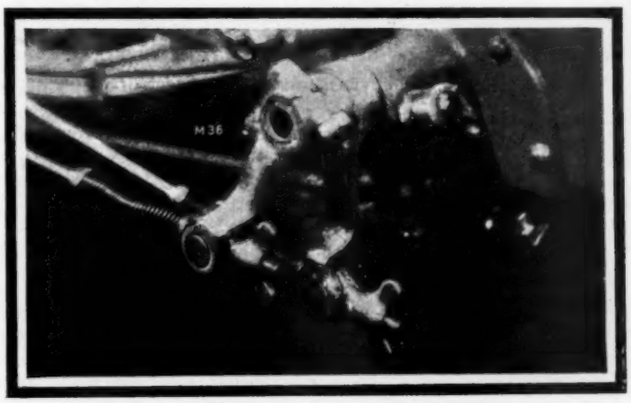


Fig. 27—The convenient Alco brake adjustment

Would this advance in transportation methods be made were it possible to show that the newer method is inferior? Are the progressive merchants and other citizens, who do use automobile transportation, to be looked upon as lacking in wisdom? Is the man who has had absolutely no experience to be taken as the judge as compared with the man who has had, and is acquiring, experience? The propaganda of the automobile, from now on, if it is to be a vigorous one, must be along forceful lines and the truth must be taken advantage of. The trouble is that we do not know how well the automobile is serving in the cause of humanity, and quite a few of us are easily bluffed into a state of silence by those who still continue to theorize in the face of practical demonstrations that cannot be denied.

There Is No Choice Left for the User

There was a time when it was prudent on the part of those who had goods to transport when it was for them to make an attempt at discriminating between relatively inferior automobiles and the methods then in vogue—the horse. As it stands now, however, users have no choice; it is no longer a question of how good the automobile is. It merely remains to determine, if possible, how much inferior the horse is.

Of the duties that can now be assigned to the automobile to perform, there are none that it cannot handle better than in any other way.

Illustrating the Value of Good Lighting

First Chauffeur—Bill, if you don't let up on that vile whisky you will go blind.

Second Chauffeur—What do you care, Pete; ain't de lamps on me car up to snuff?

Specimen of Garage Gossip

Dirty-faced Charley—That governor of mine would pair off perfectly with an ass.

Towe-head Gus—Nothing is ever perfect; you are a little fatter than he is.

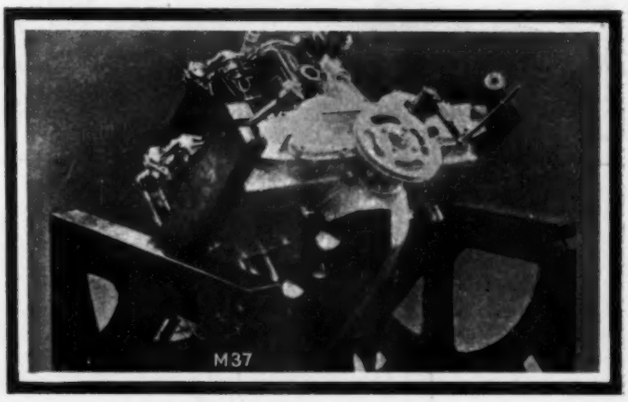


Fig. 28—The Rainier motor exhibited on tipping stand and sectioned to show workings

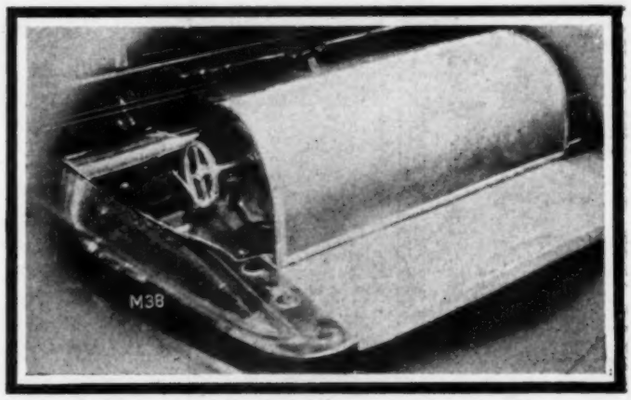


Fig. 29—The Knox shoe scraper on running board and the stem of the Prest-O-lite tank fitted with a pulley wheel

TRANSMISSION

CRANKSHAFTS of motors rotate at a speed consistent with the power requirement, while the road wheels of the automobile must rotate consistent with the road condition, or as the operator wills, so that when the angular velocity of the road wheels changes it does not necessarily follow that the crankshaft revolution will change in the same ratio, but in order to be able to vary the rate of speed of the road wheels without changing the rotation of the crankshaft of the motor, it is either necessary to utilize a transmission gear or slip the clutch.

In the slipping of a clutch there are two considerations, the first of which is that the slipping members will be subjected to a gross eroding effect and will soon wear out, and it follows as a sequence that the efficiency of the power transmission through slipping members will be extremely low. Granting that a high mechanical efficiency is a commercial requisite, it remains to deliver the power from the motor to the point of contact of the traction tires with road with a minimum of friction, and conceding that a slipping clutch would induce a maximum of this undesired component, it remains to provide a clutch that may be actuated without resorting to the slipping principle for speed changes, and with motors as they are at present perfected, all lack of flexibility is made up for through the utilization of a system of gears by means of which the ratio of the rotation of crankshaft to that of road wheels may be varied at will.

For the benefit of those who may become interested in the purchase and use of automobiles, remembering that they may not have given these matters a measure of consideration, it remains to point out that there are types of transmission gears in vogue which are commercially designated as follows:

PREVAILING TYPES OF AUTOMOBILE TRANSMISSION GEARS

(A) Three-speed, selective, arranged for direct drive on high gear;
(B) Four-speed, selective, arranged for direct drive on high gear;
(C) Four-speed, selective, arranged for direct drive on third gear;
(D) Four-speed, selective, arranged for direct drive on third and fourth gear;
(E) Three-speed, progressive, indirect on high gear;
(F) Four-speed, progressive, indirect on high gear;
(G) Modifications of these principles with three and four speed changes;
(H) Planetary gears giving two speeds and reverse;
(I) Beveled sets arranged for two, three and four speed changes.

By consulting the tabulations of the automobiles of the year, it will be possible to obtain definite information bearing upon the preference which is given the respective types of gears as here referred to, and to note simultaneously the types, character and sizes of the automobiles which are given the benefit of four speed changes; a count of the automobiles which appeared at the A. L. A. M. show at the Garden in New York resulted in:

Number of automobiles fitted with three-speed selective-transmission gears, 278.

Number of automobiles fitted with four-speed selective-transmission gears, 143.

Number of all automobiles fitted with three-speed progressive transmission gears, 4.

Number of automobiles fitted with four-speed progressive-transmission gears, none.

Number of automobiles fitted with planetary types of transmission gears, 16.

Number of automobiles fitted with special forms of transmission gears other than those as here designated, 19.

This recount of the prevailing styles of speed-changing devices is a sufficient indication of the popularity of the three-speed selective type of transmission gear, and a careful examination of the automobiles to which it is attached, goes to show that the designers generally take into account the ruling factors in making their selection, among which will be mentioned:

(A) The ratio of power of the motor to the weight of the automobile.

(B) The gear ratio of the bevel set or other means of reducing the speed of the driven shaft of the transmission gear to that of the road wheels.

(C) The characteristic of the motor, taking into account its flexibility of performance, having in mind the fact that the maximum power of the motor is not the essential consideration.

(D) Hill-climbing ability.

Flexibility of the Motor Must Be Considered

In a technical article, which appeared in *Omnia*, it was pointed out among other things that there is an intimate relation between the transmission gear and the motor. It would seem from the points made in this particular case, considering other information bearing upon the same subject from many quarters, that there is grave danger of overlooking the fact that a motor, however good it may be, might be so harnessed in the chassis of an automobile that it would be rendered incapable of delivering its maximum power, and it might even be so hampered that it would fail to deliver even indifferent success.

To the trained engineer it is obvious that the rating of a motor as it is given in horsepower means little or nothing. It is also clearly indicated that the torque of a motor as it is measured at its maximum point means very little. It is torque multiplied by speed that represents power. In the average motor the torque is maximum at substantially two-thirds of its maximum speed, and the torque recedes as the speed increases so that if the torque recedes faster than the speed increases, the power of the motor will decrease, and the aim of the average designer in his quest for flexibility is to so contrive that the torque will remain at, or near, its maximum, notwithstanding the speed increases, and by attaining this object the power of the motor will increase with the speed, or the flexibility of the performance of the motor will be maximum at a given speed.

It is too much to expect of a well-performing automobile that it will climb high mountains, excel in racing and be economical in the consumption of fuel besides. The designer who chooses can give either one of these qualifications, but the designer who can present all three of them in accentuated form has not as yet made his graceful bow to an intelligent audience.

Broadly speaking, the aim of the builders of the cars which will be available for the coming season is to level off the high spots for the purpose of obtaining an all-around good result. It is recognized that mountain-climbing characteristics and terrific road speed may be attained if the ratio of power to weight is increased sufficiently, and if the transmission gear is provided with a suitable number of speeds. But the gasoline consumption will be excessive in a combination such as this, due to the fact that the motor will be but slightly loaded nearly all of the time. The thermal efficiency of a motor, that is to say, its ability to economically utilize the fuel value in gasoline, increases as the load is increased up to a certain point, but it decreases if the motor is loaded beyond a certain point. This means that the most economical performance will come when a motor is "comfortably" loaded.

The comfortable loading of a motor, if it is used in the propulsion of an automobile, requires that the motor be neither too large nor too small, considering the weight of the car and the gear ratio of the transmission system. There are men who seem to labor under the impression that it is not necessary to consider the comfort of the motor, so long as a transmission gear system is provided. It is just possible that these men overlook the fact that the average human being is not endowed with that measure of intuition which will permit him to foresee the wants of the motor as they are reflected in the ever-changing road condition, and that the sliding of the gear is a process which is dictated by overbearing necessity rather than by conditions of economy.

Life of the Automobile Is Involved with Flexibility

To the intending purchaser of an automobile there are other important considerations involved in this question of comfortable performance, if such it may be called. The other day a French engineer of excellent understanding wrote a story around the idea that a motor might be known as a "soft" performer, or it might acquire a reputation for being a "hard" performer. It was a good story because it presented the matter in an understandable way. The "hard" motor, as it was referred to in this instance, was really a motor which would be noted for its ability to deliver power with a high weight efficiency, what one might call a racing motor; it would lack flexibility, but the "soft" motor, is one which might be described as an all-around good motor, just such a motor as designers aim at for use in automobiles in general.

Coupling this idea of the "soft" motor with the thought that the life of an automobile must necessarily depend upon the amount of power that the motor is capable of delivering, leads one to the further conclusion that, if the delivery is "hard," the life of the car will be shortened, whereas, if the delivery is "soft," the depreciation factor will be relatively inconsequential. In discussing forces it is always recognized that if a weight in motion is brought to rest within half of a given distance the force of the blow will be four times as great as if the weight is brought to rest within a given distance. Since the characteristic of performance of a "hard" motor, so-called, is such that it will propel the automobile vigorously or not at all, it stands to reason that the mechanism of the car will be severely treated, first, in the rapid rate of acceleration, second, due to high speed, and, third, when the brakes are applied and the mass is brought to a standstill.

Not so with the "soft" performing motor. It is devoid of a harsh accelerating ability, nor does it drive the automobile at a racing speed. The transmission gear would necessarily have to be provided with four speeds were a "hard" motor impressed into touring service, due to the fact that the motor would not lend to the speed-changing requirement, and four speeds would be necessary in the chain system in order to satisfy practical road conditions. With the "soft" motor the main idea is to avoid speed changing entirely under average road conditions, and to depend upon the motor to deliver a requisite measure of power at the varying speeds as indicated by the rate of travel of the automobile on the road, thus reserving the speed changes in the transmission system for emergency work, as when very steep grades are being negotiated, or in soft going on sandy roads, or after a period of inclement weather when the mud formations are noticeably deep.

In connection with the all-around good performing motor there remains a legitimate use for four-speed transmission gears, it being the case that if the motor is high powered and the automobile is a large one, it is advantageous to employ a series of speed changes with a relatively small increment of change between the respective gearsets. In cars of this class, when they are provided with four speed changes, the operator is given a wider choice under considerably varying road conditions, and the fuel economy is maintained at a considerably higher level than might be otherwise true.

The time has passed in the automobile business when a magazine could be made with a sufficient number of pages to afford

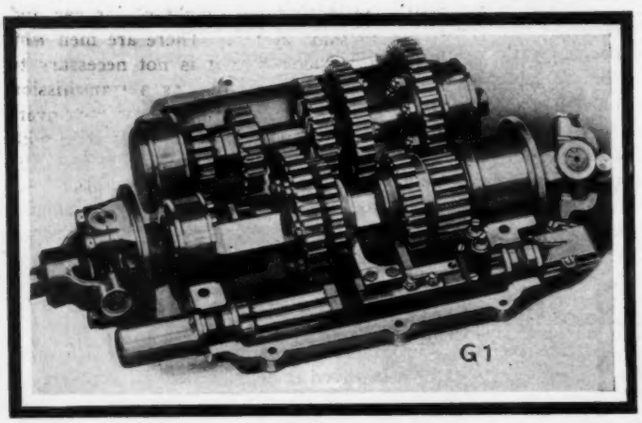


Fig. 1—Pierce-Arrow four-speed selective type transmission, with square sliding shaft and annular ball bearings

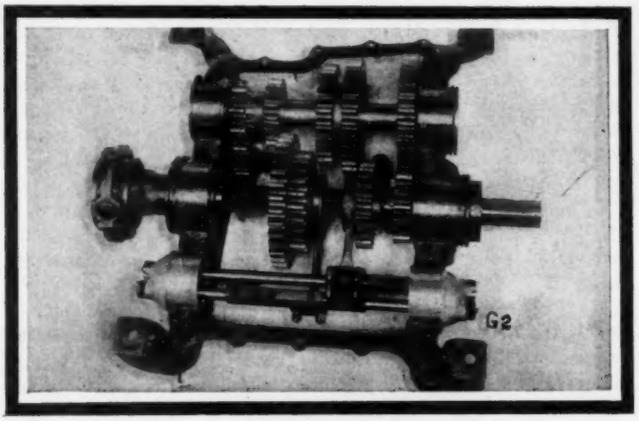


Fig. 2—Locomobile four-speed transmission, with bronze case and aluminum cover

space to every make of transmission gear. It will be possible, however, to illustrate examples of the different types and to show important variations, thus making it possible to state to which school of design the various makes of automobiles belong. The illustrations are selected under the circumstances as being representative of schools of design, and the general trend of practice in the making of transmissions, indicating the substantial nature of 1911 workmanship.

Figures 1, 2, 3, 4, belong to the four-speed selective class showing various methods of application. In Fig. 1 is shown the Pierce-Arrow gear set with top half of the cover removed. The shafts are carried on large annular ball bearings fitted with dust covers and these are also fitted to the striking rods. Interlocking spring compressed pointers hold the slides in place after the gear has been thrown into mesh. The sliding shaft is square and the high gear direct drive is obtained by sliding the long primary pinion inside the third speed pinion. The Locomobile gear box shown in Fig. 2 is somewhat similar in construction to the latter but the body of the housing is made of brass with an aluminum cover. The high gear engagement is

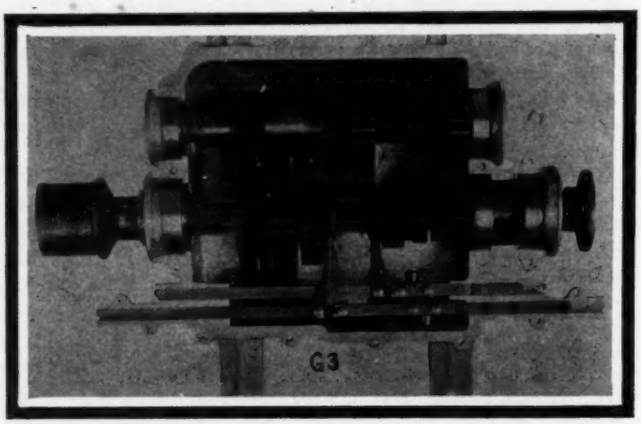


Fig. 3—Pullman four-speed transmission, with four-key solid milled shaft

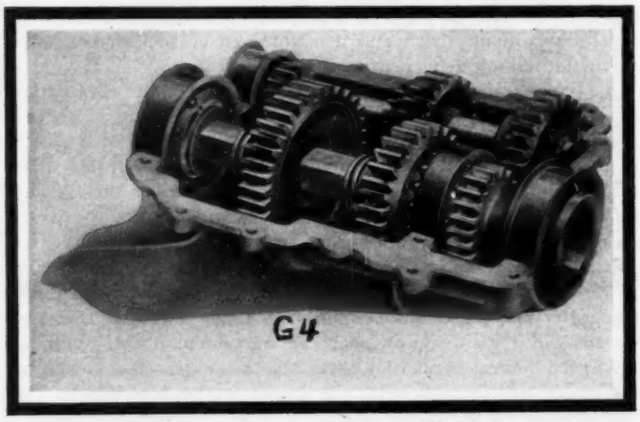


Fig. 4—Columbia four-speed transmission showing resting of gears

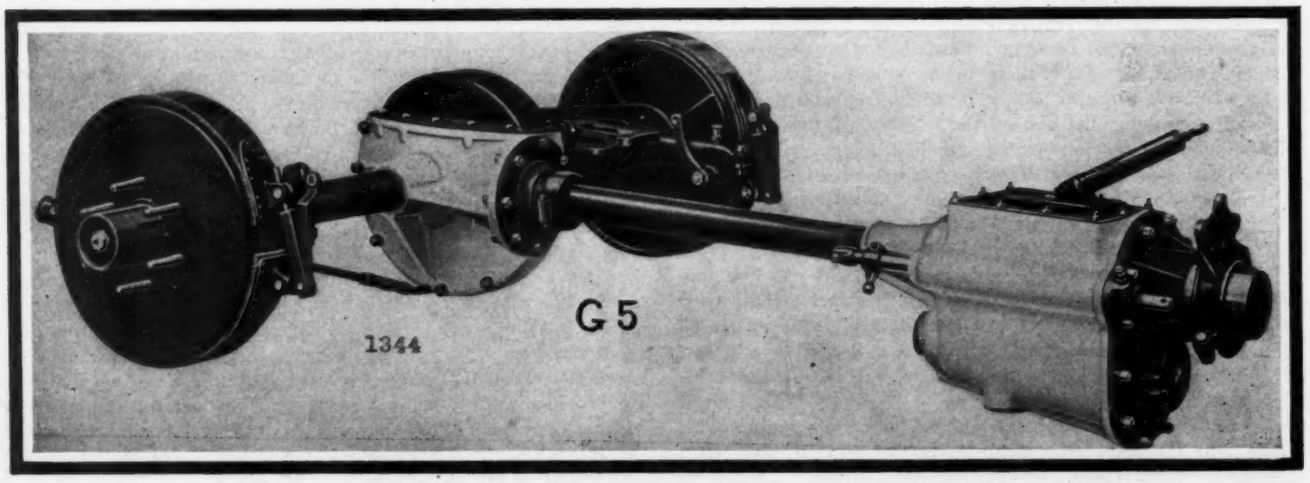


Fig. 5—Rambler transmission and rear axle construction transmission, drive shaft and axle assembled as unit, eliminating universal joints. Adjustable taper roller bearings are used.

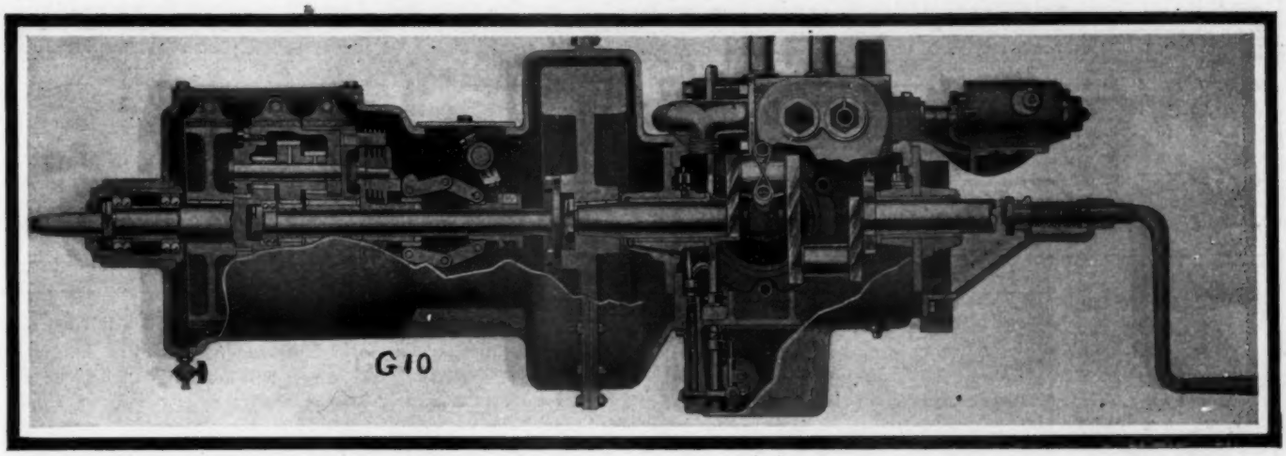


Fig. 6—Oliver transmission of the planetary type, showing three speeds and clutch in one unit, with motor and flywheel

by jaws as shown tapered off towards the edges to allow easy engagement in changing. The engagement forks are made separate from the striking rods which carry a slotted bar for correct meshing purposes.

In the case of the Pullman type as shown in Fig. 3 it will

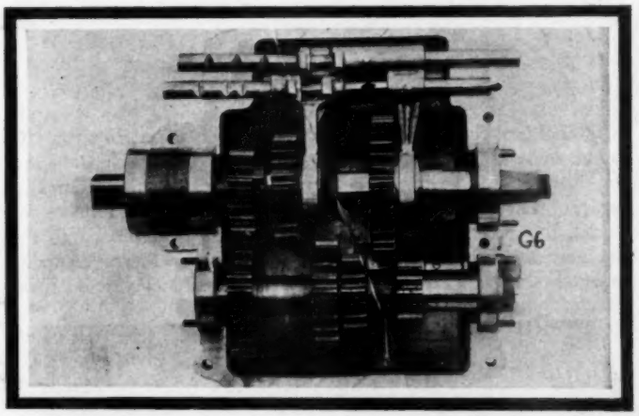


Fig. 7—Premier speed transmission, with five ball bearings

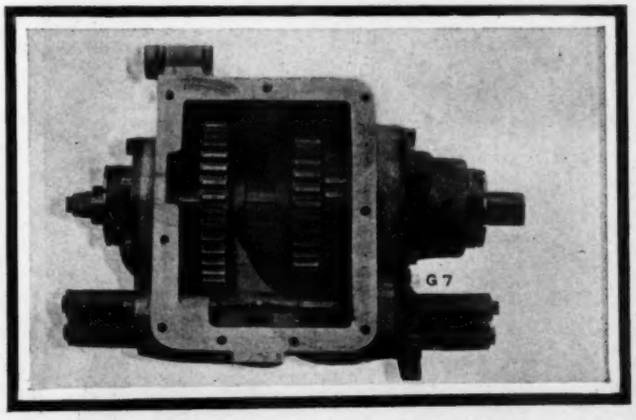


Fig. 8—Thomas three-speed selective transmission, showing striking rods entirely enclosed

be noticed that the shafts are longer and that the striking bars carry side pins over which the actuating arms are attached. The primary shaft in this case has four keyways milled out from the solid cylindrical shaft and the high gear engagement is by dog clutches. The Columbia shown in Fig. 4 carries ball bearings behind the constant mesh pinions thereby taking to a certain extent the strain of the load more in the center of the square shaft. The type of transmission used on Rambler cars as shown in Fig. 5, is known as the vertical because one shaft is placed vertically over the other. The transmission is attached to the rear axle by the tube, thus eliminating universal joints.

Figs. 7, 8 and 9 are types of three-speed transmissions. In this type the shafts can be considerably shortened and it is common practice to make the gear wheel large; an example of this is seen in the Thomas transmission in Fig. 8. The other types shown are the planetary set of the Oliver and the friction type used on Cartercars.

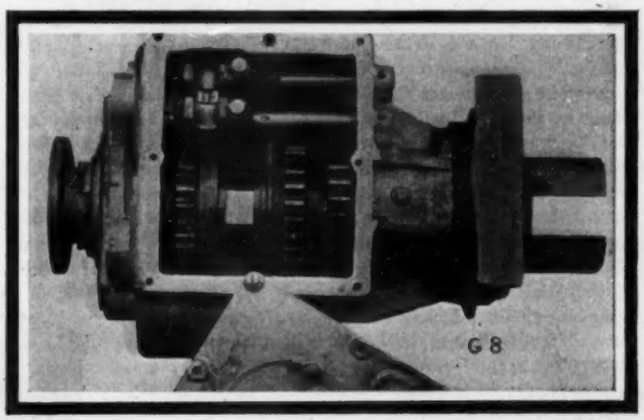


Fig. 9—National three-speed selective transmission, allowing the gear shafts and bearings to be removed without disturbing the case and alignment

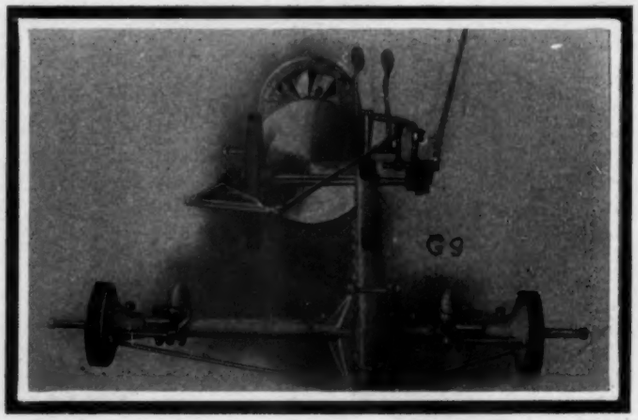


Fig. 10—Cartercar type of friction transmission, showing friction discs and enclosed chain drive

Worm Drive Latest For Commercials

THE first exclusively commercial automobile show given by the A. L. A. M. in Madison Square Garden during the week of January 16 was attractive, instructive and convincing. It was attractive because the motor vehicles were well displayed. The crowd of the merely curious was lacking, and those who wished to examine the cars had excellent opportunities for doing so. The conditions as to ventilation were much better than during the previous week and the show was not so large as to prohibit proper inspection of every make exhibited.

The show was instructive for it illustrated plainly the tremendous strides that have already been taken in this division of automobile building. There were no cars that seemed to have been built, by "hack saw mechanics," but every make showed thought and care in design and construction. It would appear that the day is past when a frame is bought here, an engine there, and each filed and sawed until the engine can be "assembled" in the frame, and the whole becomes an "automobile." The pleasure car has taught many a lesson, but never a more important one than the necessity of quality. The great concerns that are head and shoulders above the rest to-day are there because they built honestly; their success came because the word quality was never forgotten, nor was it made secondary to profits. The big men of the industry studied the successes of America's most successful concerns and everywhere they saw but one policy, "built honestly." We all know the fate of those who have gone into the pleasure car business with the motto of the Dark Ages, "Let the buyer beware."

At the Commercial Vehicle Show there was a general feeling, expressed again and again in conversations, that the business of making power wagons is now about to become tremendous. Any man who has watched the progress of the mechanical arts has seen the machine displace the animal; not occasionally but invariably. Flesh and blood are no match for steel and fuel in doing mechanical work. The man need not feel himself a prophet who says that the horse will almost disappear from city streets; he is simply stating a fact which is as inevitable as death. The volume of sales in business automobiles this last year has been much greater than many imagine. One company in one city sold 120 three-ton trucks. The business now is in need of salesmen trained in this particular line, and of clever educational work among users.

It is just as important for the salesman to sell his truck where it will be properly cared for as it is for him to make the sale. The business worth getting in the commercial field is that which will bring repeat orders. The truck sells for approximately 50 cents a pound, while the pleasure car brings more nearly 100 cents a pound. As "missionary work" costs, the reason for the repeat order is obvious. It is also an investment to make friends among those who purchase cars.

First to attract attention was the new Pierce, which had not before been shown. The excellent reputation of this company in the production of pleasure cars caused the 5-ton Pierce truck, as shown in Fig. 3, to be examined with more than usual care, and interest. It has been generally known that this company, for the past two years, has designed and built a number of trucks, but that none have been marketed. Preliminary to the commercial production of commercial cars the Pierce company engaged the services of an able engineer, who had spent

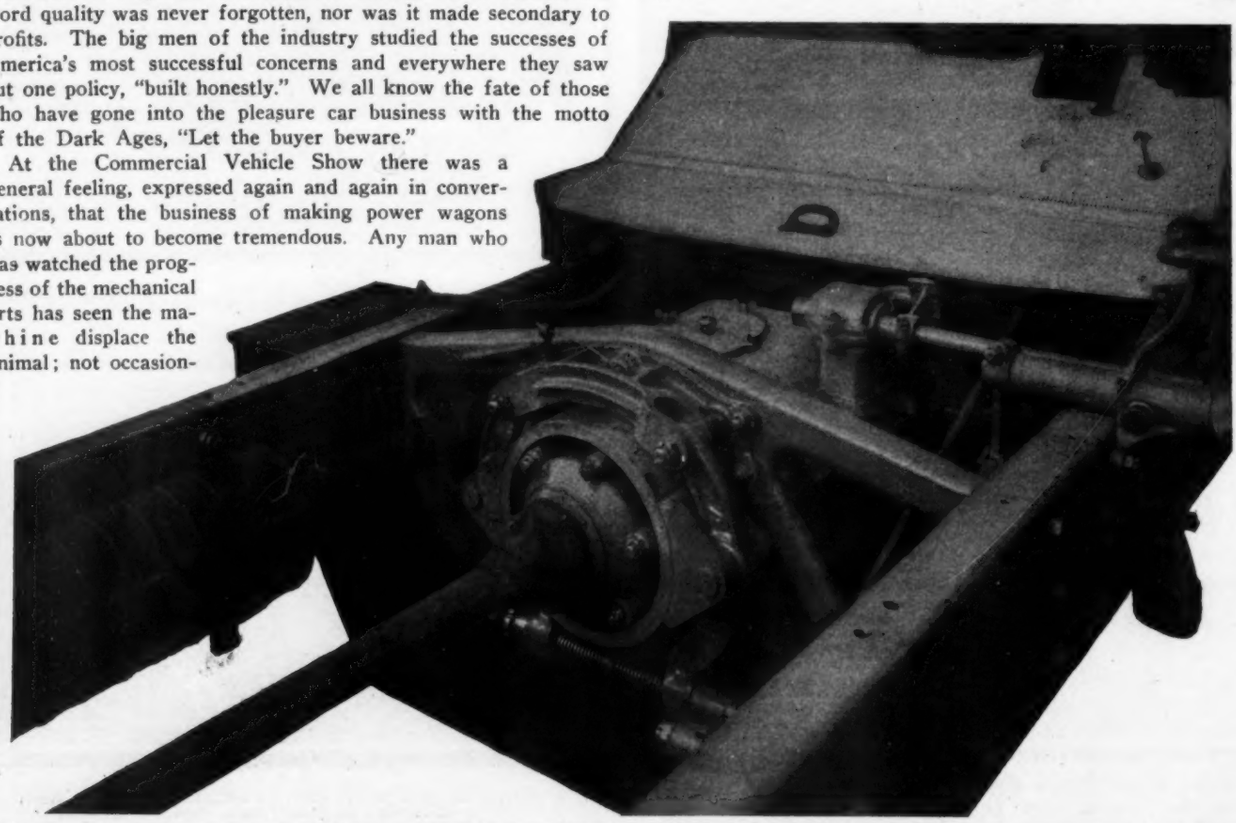


FIG. 1—SHOWING THE SERVICE BRAKE OF THE PIERCE-ARROW FIVE-TON TRUCK AND THE SUBSTANTIAL CHASSIS FRAME AND CROSS CONNECTIONS

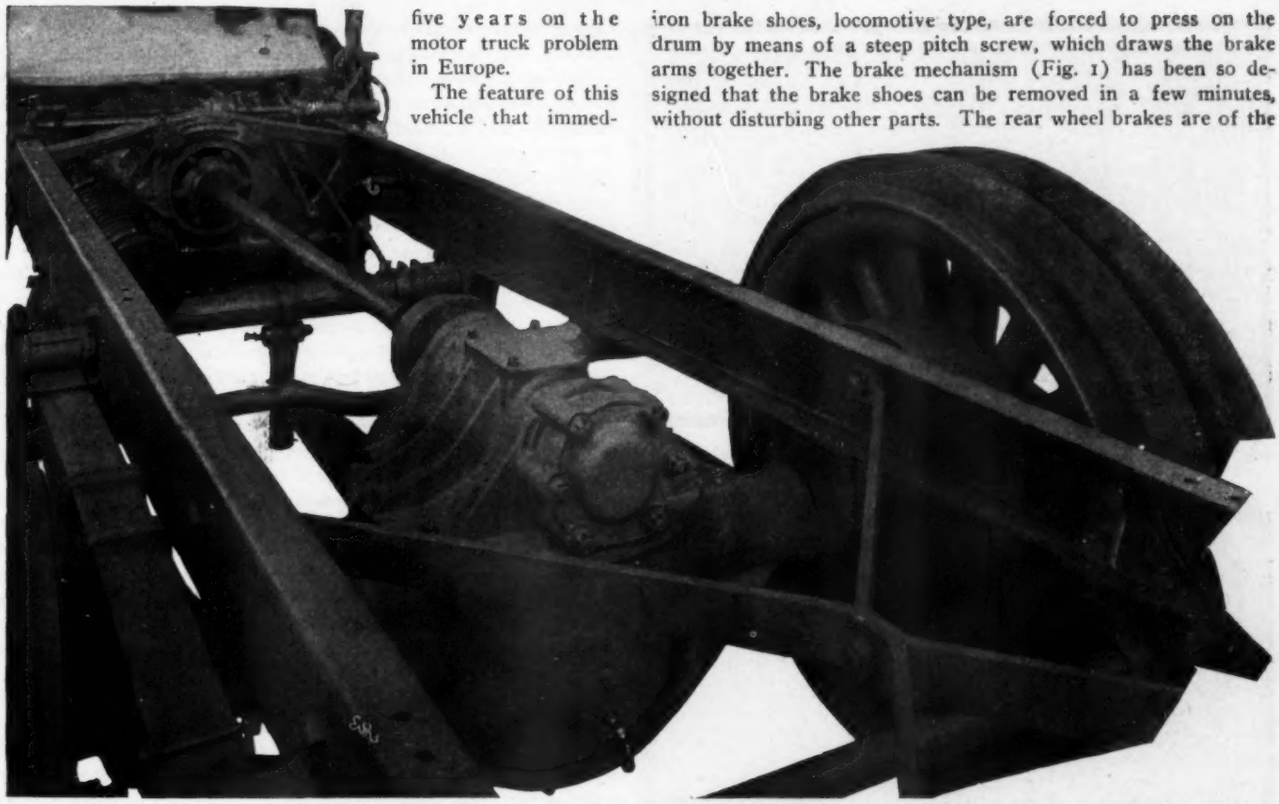


FIG. 2—REAR VIEW OF THE WORM DRIVE OF THE PIERCE-ARROW FIVE-TON TRUCK, SHOWING THE STRAIGHT-LINE RELATION OF THE POWER MEMBERS

five years on the motor truck problem in Europe.

The feature of this vehicle that immediately won attention was the worm drive, as shown in Figs. 2 and 5. A five-ton truck without chains! The idea is new, at least in this country, although the Dennis has been running motor busses in London from the start with worm drive. The Franklin, in our country, has used the worm drive on lighter cars for a year or two now. In the drive, a five-threaded worm is used which engages with a 39-tooth wheel. The speed reduction ratio is 7.83 to 1. This is a sufficient reduction in a primary sense, to accomplish the desired purpose, permitting of the running of the motor at its most advantageous speed all the time, and making it necessary to regulate the travel of the freight automobile through the flexibility of the motor on the one hand and by sliding the gears in the transmission system as a secondary matter. The zone of stability of the motor is fully taken advantage of under these conditions, due to the excellence of the gear-ratio, and the chances of damaging the motor are reduced to the lowest possible limit.

The Pierce truck was noteworthy for its general design as well as for its special drive. The engine (Fig. 4) is a four-cylinder of 4⅞ bore and 6 stroke. A centrifugal governor acts directly on the throttle to keep the engine within a fixed speed limit. The motor is supported at three points. The forward point of support is from an engine hanger which runs from side member to side member, a special frame cross member, in other words, which is provided with a type of attaching joint that gives the flexibility desired. The standard Pierce carbureter is used, and the ignition is double, with magneto and spark coil. The maximum speed of the car is 13 miles per hour.

A cone clutch is used with a clutch brake to stop spinning. The transmission case is of aluminum, and carries three speeds forward, with a direct top speed. The drive from the transmission to the rear axle is "straight line." The driving shaft is supplied with two universal joints. The transmission, with the brake drum attached, can be pulled forward by taking out a few bolts, and then dropped clear of the frame. The transmission brake, which is ten inches in diameter, is of steel. Two cast-iron brake shoes, locomotive type, are forced to press on the drum by means of a steep pitch screw, which draws the brake arms together. The brake mechanism (Fig. 1) has been so designed that the brake shoes can be removed in a few minutes, without disturbing other parts. The rear wheel brakes are of the expanding type, and the braking surface is 20 inches in diameter with a 4 1-2-inch face. An equalizer is provided. The rear axle is a steel casting, or rather is built up of several steel castings, and two pieces of steel tubing. The worm and worm wheel are supported in fixed relation to each other by the casting which forms the cover of the differential case. By this construction, and by carrying both worm and wheel on annular ball bearings of ample size, permanent alignment is secured.

The gear casing is a one piece steel casting, and is oil tight. It is provided with a level cock so that the oil level may be easily found, and maintained. As might be expected, the case is kept almost half full of oil in service and the shafts which drive the rear wheels are run through stuffing boxes to prevent the escape of the lubricant. The central case has two lugs which hold the torque member. Dovetailed into the ends of the central case are the steel castings which take the radii rods, and the spring seats. The wheels are carried on sleeves formed by forcing two lengths of steel tubing through both castings.

The frame, as seen in Fig. 3, itself is worthy of study, for its design is the result of study. An attempt has been made to have the strength of the frame at various points proportional to the loads at those points. At the front seat the frame has a depth of 8 inches, while at the rear end its depth is but 3 1-2 inches. It is made of carbon manganese steel, and is heat treated. Every design on this truck chassis, whether it be assembly or detail, seems to have been given thoughtful consideration, and as a result the Pierce truck is interesting. In the use of the worm and gear for making the reduction form the speed of the motor to the rotation of the live rear axle, the worm is advantageous, so it would seem, partly on account of the efficiency of a well-contrived form, and, again, in view of the excellence of the conditions, involving a straight-line drive. Then the question of noise is eliminated; worms are not noise-makers. The chassis frame and the crossbars in this example are well contrived and suitably proportioned for the weight contemplated.

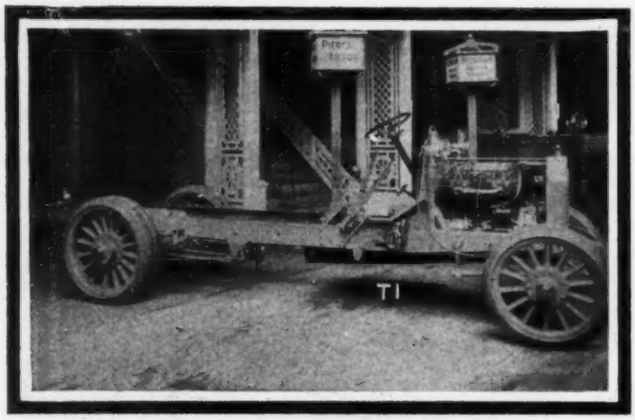


Fig. 3—Side view of Pierce 5-ton truck, showing frame strong where it needs strength

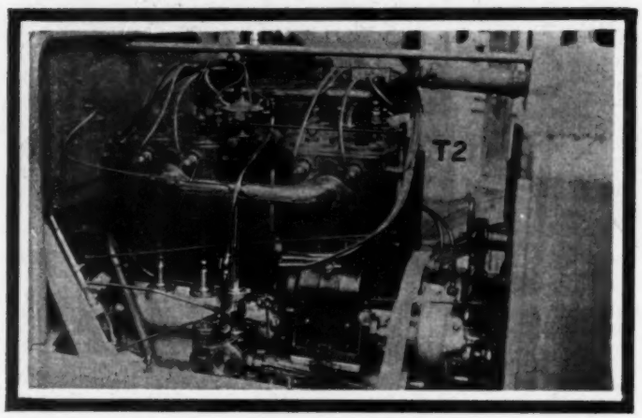


Fig. 4—Pierce power plant—4 7-8 bore, 6 stroke

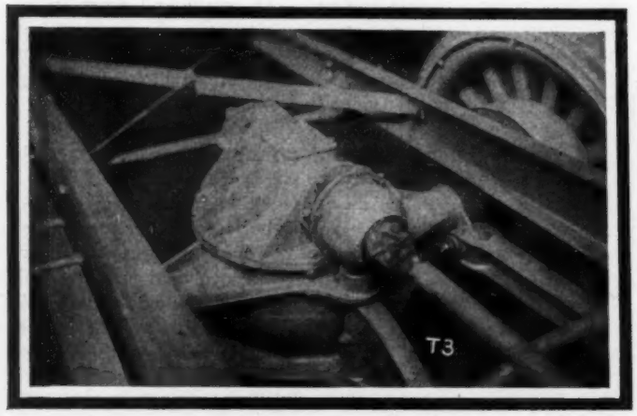


Fig. 5—Pierce worm driven axle. Both worm and wheel are attached to cover, securing fixed alignment

The Stearns three to five-ton also made its initial appearance. The novel feature of this truck was the providing of a separate and independent spring suspension for the motor as seen in Fig. 6, which was done by the use of two semi-elliptic springs, 1 3-8 inches wide and 32 inches long, placed in an accessible manner parallel to the frame at either side of the motor subframe.

The motor subframe was made U-shape. The two arms of the U were hinged at their rear ends to the countershaft carrying the sprockets. At a point some 20 inches back of the frame front cross member two brackets were provided on the main frame to act as supports for the springs that carried the subframe. This subframe was made enough narrower than the chassis frame to allow the carrying springs ample room. The driver's seat was also mounted on the subframe, so that the driver, too, got the advantage of the special spring suspension. By this arrangement of independent springs for motor and driver, the sharper road shocks are prevented from reaching the power plant, or its connections to the frame, and the driver is assured comfort whether his truck be loaded or not. Those who have ridden in a large truck which was empty of load will appreciate what this must mean by way of physical comfort. On the Stearns was found an excellent brake adjustment. Just in front of the countershaft carrying the sprockets two levers had been mounted on the same cross brake shaft, one of these fixed, the other free to rotate, except as held to the fixed lever by means of a clevis, and wing nut. By turning the wing nut the angular position of the levers was changed in relation to each other, and brake adjustment was secured. The Stearns used the chain drive, without chain cases, and except for the special subframe springs was of what might be called standard construction.

The Morgan truck was interesting in the use of a special valves-in-the-head motor. The head in which the valves were located came out by the removal of half a dozen nuts, and brought with it the complete valve mechanism. The cooling was effected by water circulated in the head itself, and the valves were not in cages, but had seats directly in the metal of the head. On this five-ton truck either planetary or slide gear transmission systems are supplied.

The new Peerless truck placed the engine in front, under a hood. It, in general, represented the truck construction that seems most nearly standard, four-cylinder motor, four-speed selective transmission, with sturdy gears, bevel gear driven countershaft and double chain drive. On the Peerless it was interesting to note how the front cross member of the frame had been placed far enough forward to protect the radiator, as shown in Fig. 7.

A wide variety of rear spring constructions was observed. One of the most striking was that on the new five-ton model of the Alco, Fig. 8. The rear springs were carried below, instead of above the rear axle, and the size of the holding bolts was such as to inspire confidence. One of the really important things on a truck is to be able to take care of overloads without "bumping." The Alco auxiliary spring indicated, by its size, and arrangement, that "bumping" would be almost impossible without the grossest of overloading. There were all kinds of auxiliary springs but no arrangement was seen that follows the same plan of design as that of the Alco in these details.

The Lansden electric, on one of its models, showed a type of spring suspension that is, to say the least, unusual. Four spiral springs, arranged vertically in yokes, took the place of the usual semi-eliptic spring, as seen in Fig. 9. The Lansden Co.

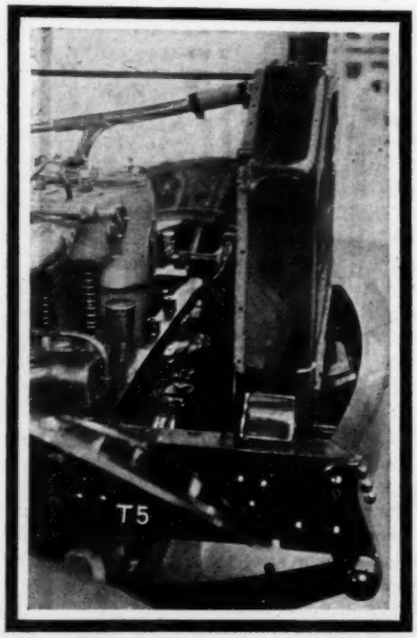


Fig. 7—Peerless showing method of supporting engine and protecting radiator

uses standard spring construction also; the spiral springs being used for ambulance and special service work where soft riding, with solid tires, is essential. A device on the lines of the friction type of "shock absorber" is used in connection with this spiral spring suspension to "dampen" the action. The Lansden is using the Edison storage battery exclusively. The control on this car is a model of simplicity.

The White line of commercial cars has been augmented by the addition of the new White 3-ton truck. The 1,500-pound capacity model had an ingenious buffer. The frame sides were provided with sockets into which a U-shaped round bar was slipped, and held with set screws, as shown in Fig. 10. This bar was heavy enough to be of real service at the critical instant, and yet it was so readily removable that a new one could be substituted in less than half an hour, and probably in ten minutes.

The new White 3-ton truck placed the driver to the rear of the motor. This truck represented standard design and construction except for the steel wheels (Fig. 11) which are somewhat unusual in American practice, although Milnes-Daimler has been using them abroad for five or six years.

The 10-ton Hewitt truck attracted attention on account of its great size. The simplicity of the steering gear on this model seems worthy of comment, for it was of the most simple variety of rack and pinion type, as seen in Fig. 12.

The Packard 3-ton truck shows no change from last year. The spring support as shown in Fig. 13 for the radiator on the Packard is a nice piece of design, for it is both simple and effective. The radiator bracket is provided with two lugs, through which a hole is drilled. A single leaf spring is curved into C-shape, and provided with an eye for a spring bolt. Two slots cut in the end of the spring allow the lugs on the radiator bracket to enter, and a bolt completes the fastening. From present indications every motor truck will eventually have its radiator carried on springs, since the sharp vibrations of solid tires and stiff chassis springs are too much for soldered radiator joints, unless the radiator is given a spring hanging all its own. The new Knox truck had also a spring suspension of the leaf type for its radiator.

The Autocar attempts to get the maximum body platform with a minimum of wheelbase, and with this result in mind places the driver over the two-cylinder opposed Autocar motor. By an ingenious linkwork the seat and the seat box sides can be raised, so that the motor is completely accessible, shown in Fig. 14. This construction goes to show what can be done to remove seat parts quickly, and with a minimum of trouble. The Autocar uses a compound drive in its rear axle as illustrated in Fig. 15, that enables a large speed reduction to be obtained. The driving shaft carries a bevel pinion that meshes with a bevel gear in the same manner as in the regular bevel driven axle, but, instead of the bevel gear being on the rear axle itself it is placed on a countershaft that carries a spur pinion meshing with a spur gear attached to the differential spider. This construction, which the Autocar Company first used on its pleasure cars some eleven years ago, enables a large reduction to be obtained without the use of a bulky mechanism. The Autocar chassis has a capacity of 3,000 pounds. Due to its engine location it is able to give proper body space for this load, on a wheel base of only 97 inches. The Autocar Company is assisting its customers by the operation of maintenance stations in the larger cities where most of the cars have been placed.

The Grabowsky attracts favorable attention by reason of its easily removable power plant, in the manner shown in Fig. 16. The front of the frame is hinged, and when this is opened, like a gate, the power plant can be pulled out, after a few bolts have

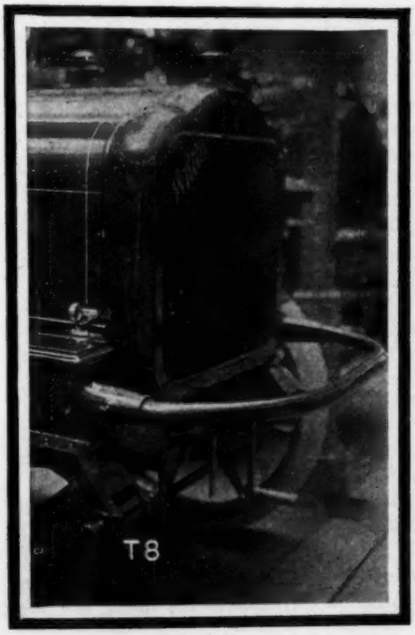


Fig. 10—The renewable buffer on the White

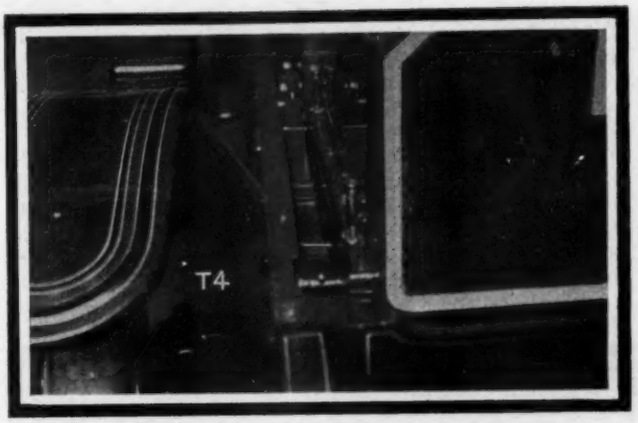


Fig. 6—Stearns showing separate springs for carrying engine subframe

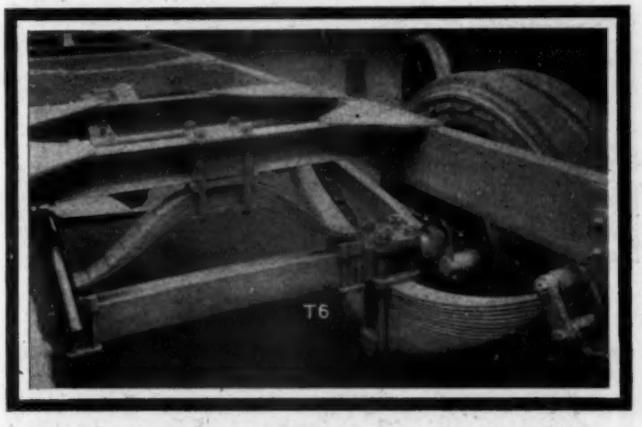


Fig. 8—Auxiliary spring on the Alco 5-ton truck

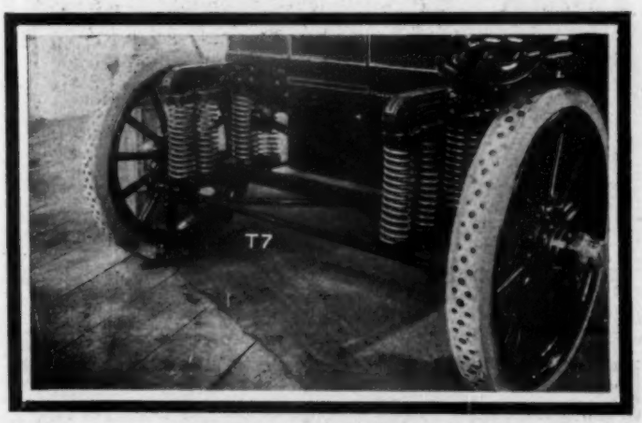


Fig. 9—A novel spring suspension used by the Lansden electric for Ambulance and special service

been removed, after the fashion of a drawer. A stand is made to hold the power plant, when out of the car, and a new power unit can be installed in a few minutes if desirable.

The Rapid two-ton truck, as seen in Fig. 17, carefully encloses its side chains in dust-tight cases, so that the metal-cutting action of gritty chain rollers is eliminated.

The manufacturers of electric trucks have frequently laid themselves open to the criticism that they did not try to eliminate noise. On a heavy truck shown by the General Vehicle Company the motor is connected to the countershaft by a silent type chain running in a chain case, Fig. 18. The ambition to reduce the noise of truck operation to the minimum is certainly a praiseworthy one. Noisy vehicles seldom make friends, for even those who are not mechanical have a feeling that noise means power going to waste.

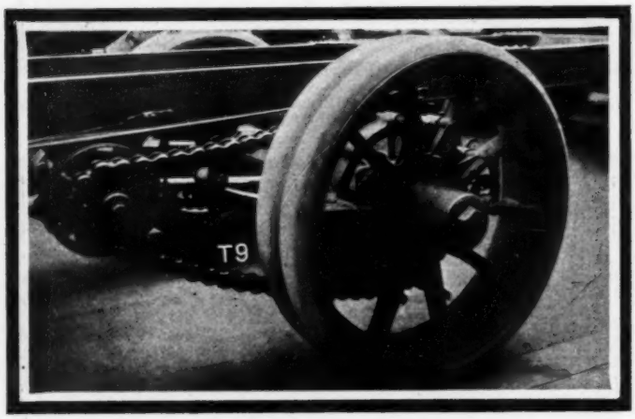


Fig. 11—Steel wheels on the new White truck

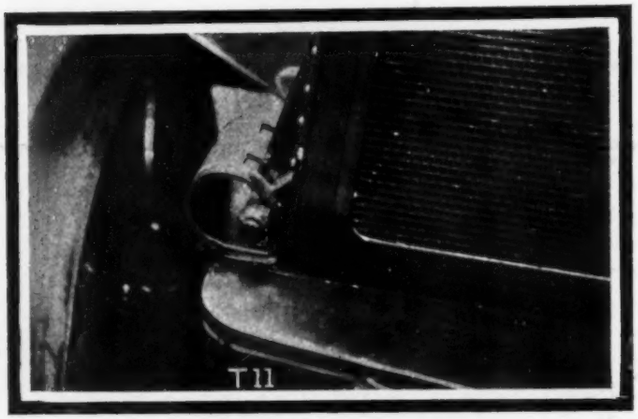


Fig. 13—Spring suspension for Packard radiator

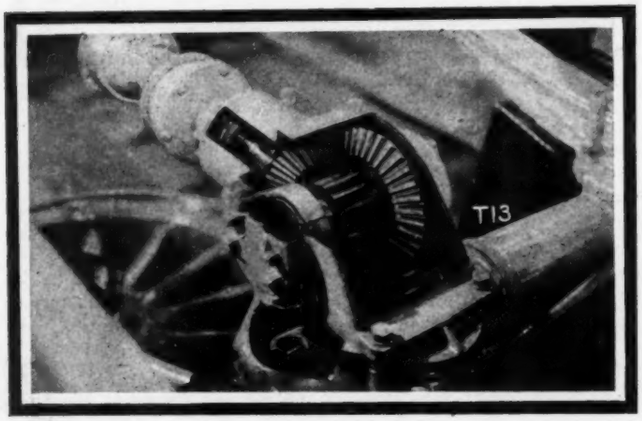


Fig. 15—Combination bevel and spur gear drive in Autocar

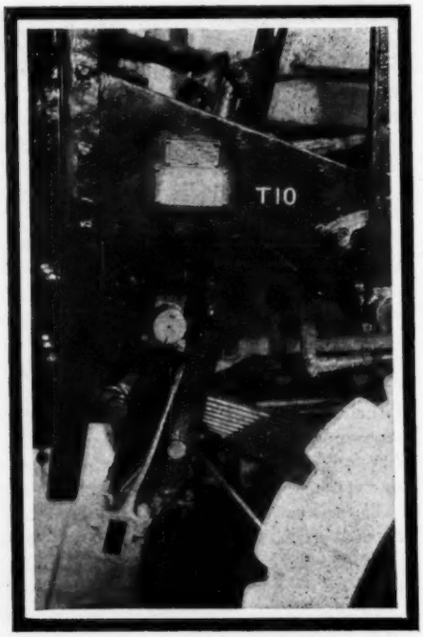


Fig. 12—Simple rack and pinion steering gear on the 10-ton Hewitt

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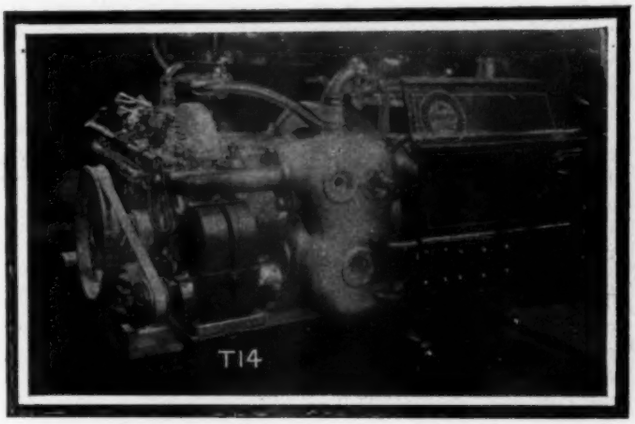


Fig. 16—How the Grabowsky slides its power plant out like a drawer

Fig. 17—Chain case on the Rapid 2-ton truck

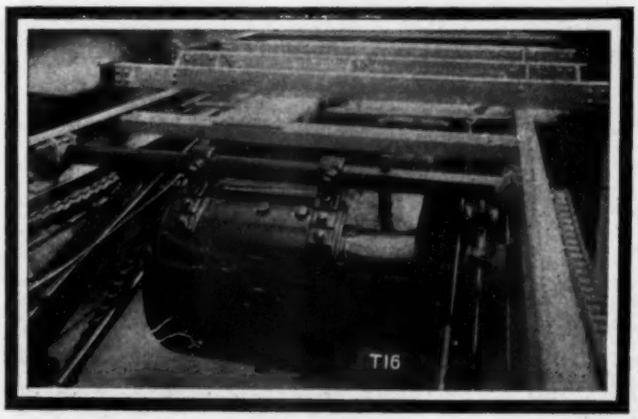


Fig. 18—General Vehicle Co.'s enclosed silent chain drive from motor to countershaft

been removed, after the fashion of a drawer. A stand is made to hold the power plant, when out of the car, and a new power unit can be installed in a few minutes if desirable.

The Rapid two-ton truck, as seen in Fig. 17, carefully encloses its side chains in dust-tight cases, so that the metal-cutting action of gritty chain rollers is eliminated.

The manufacturers of electric trucks have frequently laid themselves open to the criticism that they did not try to eliminate noise. On a heavy truck shown by the General Vehicle Company the motor is connected to the countershaft by a silent type chain running in a chain case, Fig. 18. The ambition to reduce the noise of truck operation to the minimum is certainly a praiseworthy one. Noisy vehicles seldom make friends, for even those who are not mechanical have a feeling that noise means power going to waste.

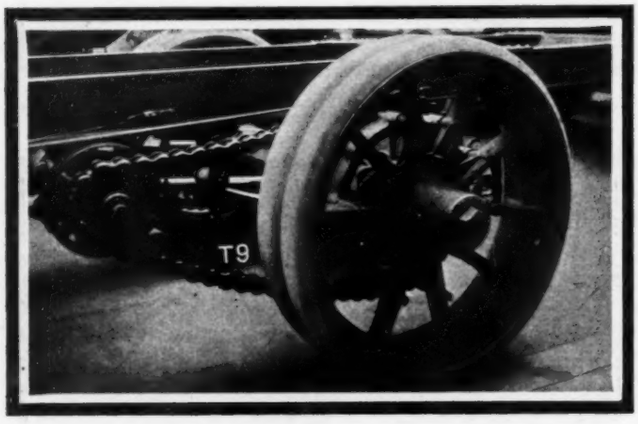


Fig. 11—Steel wheels on the new White truck

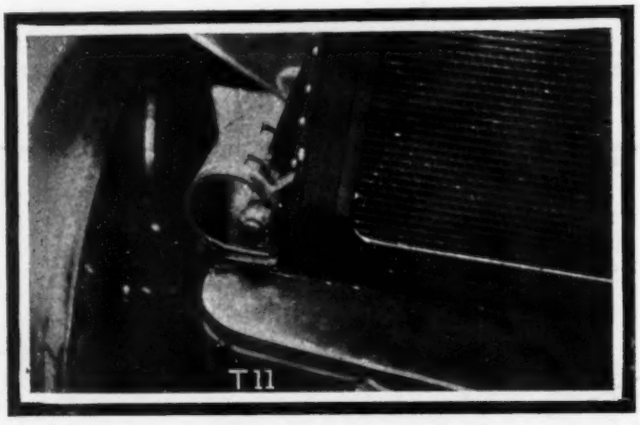


Fig. 13—Spring suspension for Packard radiator

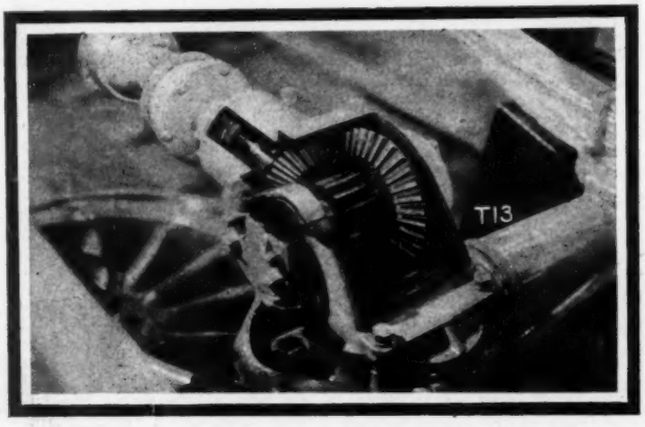
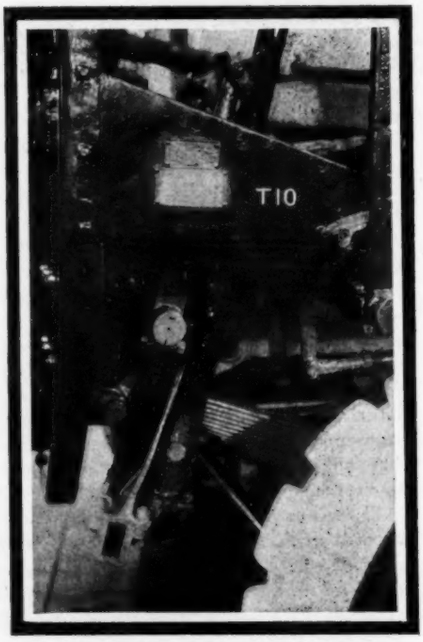


Fig. 15—Combination bevel and spur gear drive in Autocar



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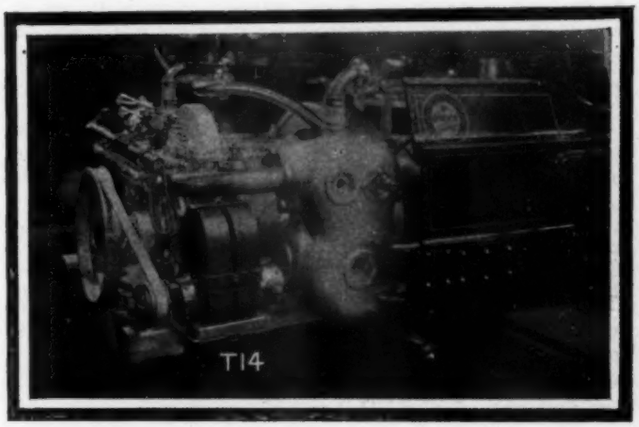

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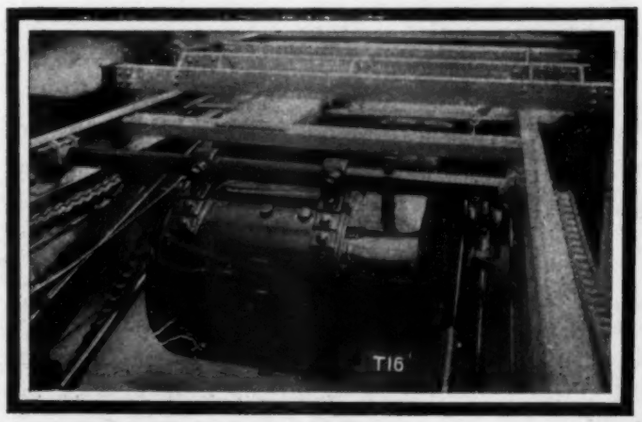

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Relation of the Gear Ratio

DISCUSSING THE ABILITY OF THE MOTOR, THE WORK IT HAS TO DO, THE GOVERNING CONDITIONS, AND HOW THE GEAR RATIO IS ESTABLISHED. BY WILLIAM D. ENNIS, PROFESSOR OF MECHANICAL ENGINEERING, POLYTECHNIC INSTITUTE OF BROOKLYN

AUTOMOBILE motors have a restricted zone of stability under speed changing conditions. To obtain flexibility at low speeds of the car, speed changing gears are indicated to compensate for the weakness of the motor and the problems for increasing flexibility are presented here in somewhat extended form, showing how the speed of the car may be varied, maintaining the speed of the motor.

Let a force of F pounds act on a body B, Fig. 1, and let the body under the action of this force move at a constant velocity of V feet per second. We are not lifting the body, so that its weight does not enter into the matter. The work done is measurable in the usual units of work, *i. e.*, force times distance, or foot-pounds. For our conditions, the work is

$$W = FV \text{ foot-pounds per second.}$$

The commercial unit of power is 1 horsepower = 33,000 foot-pounds per minute = 550 foot-pounds per second. The horsepower required for the operation shown in Fig. 1 is then

$$\text{H.P.} = \frac{FV}{550}. \qquad (I)$$

Let V_o be the uniform velocity expressed in miles per hour. Then

$$V = \frac{5280\,V_o}{3600} = 1.465\,V_o \text{ and}$$

$$\text{H.P.} = \frac{1.465\,FV_o}{550} = \frac{FV_o}{375}. \qquad (II)$$

In any vehicle of propulsion, like an automobile, a locomotive or a trolley car, we have precisely the condition of things shown in Fig. 1. The car or train, as the case may be, is represented by B. The force F necessary to move it is exerted by the motor.

We therefore inquire (a) as to the amount of force necessary to propel the car and (b) as to how this precise amount of force is to be provided.

(a) In a previous article it has been shown that the resistance to propulsion may be divided into the following parts:

$$R_1 = 0.0025\,AV_o^2 = 0.00126\,AV^2, \qquad (III)$$

$$R_2 = mk, \qquad (IV)$$

$$R_3 = \frac{mV}{32.2\,t} = \frac{mV^2}{64.4\,s}, \qquad (V)$$

in which R_1 = resistance in pounds, due to air,
R_2 = " " " , due to grade,
R_3 = " " " , due to acceleration,
A = transverse clearance area of the car, square feet,
m = weight of loaded car, in pounds,
K = proportion of grade (rise + inclined length),
s = distance traversed, in feet, while the car, starting from rest, attains the velocity V,
t = time elapsing, in seconds, while the car, starting from rest attains the velocity V.

(b) If there were no friction losses in the mechanism we should have

work at motor = work of propulsion,

indicated work per power stroke × number of power strokes per second = FV.

This expression becomes exact if we multiply the indicated work per power stroke by a factor which reduces it to an equivalent amount of work actually available for propulsion. This factor will depend upon the type of motor, its piston speed, the conditions of adjustment and operation, and the arrangement and condition of the transmission. For an ordinary four-cycle engine the work done at the shaft of the motor will be about 8000 foot-pounds per power stroke per cubic foot of piston displacement per stroke.

Following steam locomotive analogies, we may write, ignoring friction,

work at motor = work of propulsion,

and if p_m be the average net effective pressure continuously maintained, in pounds per square inch, the cylinder diameter being d inches, the total continuous pressure on the piston is $\frac{\pi}{4} p_m d^2$. If s be the stroke of the piston in inches and r the number of revolutions per minute, the distance through which this force is exerted is $\frac{2sr}{12} = \frac{sr}{6}$ feet per minute $\frac{sr}{360}$ feet per second, so that the work at the motor is, in foot-pounds per second,

$$\left(\frac{\pi}{4} p_m d^2\right) \times \left(\frac{sr}{360}\right) = FV_o \text{ whence}$$

$$F = \frac{d^2 sr P_m}{459\,V}, \qquad (VI)$$

transmission friction being still ignored.

Now, the value of p_m during a power stroke is equal to the work in foot-pounds, divided by the piston displacement in cubic feet, divided by 144. In a four-cycle, four-cylinder, single-acting engine this is also the continuous value of p_m, which is consequently equal to

8000 ÷ 144 = 55.6 pounds per square inch, whence

$$F = \frac{d^2 sr}{83\,V} \qquad (VII)$$

In Fig. 2 the body B is moved, not by direct application of the force F, but by an indirect action through the lever mgn, working about the fixed fulcrum g. Let the point m move at the Velocity V. The work at m will be as in Fig. 1, FV, and if we ignore friction at the fulcrum bearing the work done on the body B will also be equal to FV; but the force acting on the body will not be F, nor will its velocity be V. In the second sketch it is evident that the point n will move more slowly than the point m, in the ratio of the lever arms $\frac{ng}{mg}$; that is,

$$V_B = \frac{ng}{mg} V;$$

and since $F_B V_B = FV$,

$$F_B = \frac{mg}{ng} F.$$

The function of the lever is the same as that of the gear in an automobile; it varies the velocity and the propulsive force, one

inversely as the other, while keeping their product constant. It does not change the horsepower.

If u be the ratio of rotative speeds of motor and car wheel, as determined by the gear, then

$$\text{r.p.m. of motor} = u \times \text{r.p.m. of wheel.}$$

Let N = r.p.m. of wheel, w = diameter of wheel in inches; then

$$r = uN$$

$$\frac{\pi w}{12} \times \frac{N}{60} = V$$

$$\frac{wN}{230} = V$$

$$\frac{wr}{230w} = V,$$

and by substitution in (VII),

$$F = \frac{230\, d^2 s r u}{8.3\, r w} = \frac{27.7\, d^2 s u}{w}. \qquad \text{(VIII)}$$

Equations (II), (III), (IV), (V), and (VIII) are those fundamental in the subsequent discussion.

The horsepower of an automobile motor may, for the present investigation, be regarded as varying directly with the r.p.m. The tractive force F is shown by Equation (VIII) to be independent of the speed (r.p.m. or piston speed). With a given motor and car, the value of F varies solely with the gear ratio, and the horsepower varies solely with the r.p.m. Now, under any required conditions whatever, a perfectly definite tractive force is necessary; this is given by Equations (III), (IV) and (V). With a definite tractive force comes necessarily, also, a definite gear ratio u. But the required conditions involve also definite car speeds, and consequently (with a given wheel diameter) definite values for N; and these (with established values of u) necessarily fix the r.p.m. of the motor. And, finally, the definite speeds and tractive forces assigned also demand definite amounts of horsepower in accordance with Equation (II). The question arises, will the horsepower shown to be necessary by this equation be attainable at the piston speed and r.p.m. prescribed?

As an illustration, consider a car weighing 3300 pounds, with 34-inch wheels and a transverse clearance (head end area) of 25 square feet, for which the transmission friction has been found to be about 50 pounds. Let the mean effective pressure referred to the motor shaft be taken, as before, at 55.6 pounds per square inch. Suppose the following conditions to be prescribed: (a) 45 miles per hour speed on straight, level road; (b) 35 miles per hour speed on an 8 per cent. grade.

Equations (III) and (IV) give.

For the level, $R = 0.0025 \times 25 \times 45 \times 45 = 126.3$ pounds;

For the grade, $R = (0.08 \times 3300) + (0.0025 \times 25 \times 35 \times 35) = 264 + 76.5 = 340.5$ pounds.

Adding the 50 pounds friction, the total resistances are 176.3 and 390.5 pounds respectively, and the motor horsepowers required are (Equation II)

$$\text{For the level } \frac{176.3 \times 45}{375} = 21.2,$$

$$\text{For the grade } \frac{390.5 \times 35}{375} = 36.5.$$

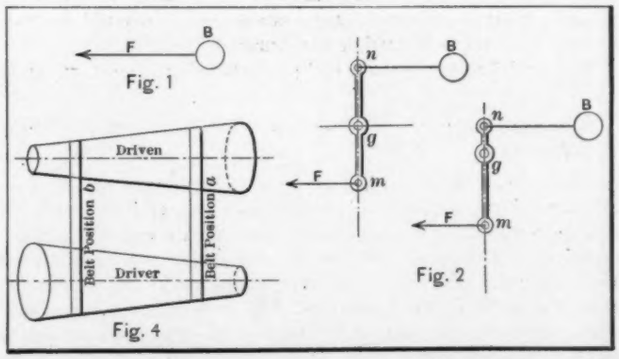

Fig. 1—Dealing with forces. Fig. 2—Study in forces. Fig. 4—Speed-changing mechanisms and phenomena

Let the motor dimensions be then made such that it will give 36.5 brake horsepower at 1,000-foot piston speed, and let this piston speed correspond to 1,500 r.p.m.

Then, since 230 V = wN and the two values of V are $1.465 \times 45 = 65.9$ and $1.465 \times 35 = 51.2$, we have for the r.p.m. of the wheel,

For the level, $N = 230 \times 65.9 \div 34 = 446$;

For the grade, $N = 230 \times 51.2 \div 34 = 346$.

The gear necessary at the grade condition is then $1500 \div 346 = 4.32$. The cylinder dimensions are obtained from Equation (VIII),

$$390.5 = \frac{27.7\, d^2 s \times 4.32}{34}$$

$$d^2 s = 111,$$

and if s = 4 inches, $d^2 = 27.8$ inches and d = 5.27 inches. In order that this motor may give the required tractive force under the level condition, Equation (VIII) gives

$$176.3 = \frac{27.7 \times 111 \times u}{34}$$

$$u = 1.95$$

Since N for the level condition is 446, while r = uN, the motor must make

$$1.95 \times 446 = 870 \text{ r.p.m.},$$

at which its power is

$$\frac{870}{1500} \times 36.5 = 21.2,$$

exactly the power required.

It is easy to show that with a properly chosen gear, on the basis of our assumptions, the r.p.m. at the motor must necessarily give the required horsepower. Thus, making temporary substitution of constants, we have,

Equations III and IV, $R = a + bV^2$,

Equation VIII, $F = cu$,

Equation II, $\text{H.P.} = \frac{RV}{m} = \left(\frac{a + bV^2}{m}\right) V$;

Also, $\text{H.P.} = dr$, $N = eV$, $r = uN = ueV$, $\text{H.P.} = dueV$,

$$= \frac{\text{H.P.}}{r} \cdot \frac{r}{N} \cdot \frac{N}{V} \cdot V = \frac{\text{H.P.}}{V} \cdot V = \text{H.P.} = \left(\frac{a + bV^2}{m}\right) V.$$

For the car in question, Equation VIII becomes

$$F = \frac{27.7 \times 111\, u}{34} = 90.2\, u,$$

and Equation I gives

$$\text{H.P.} = \frac{FV}{550} = \frac{90.2\, uV}{550} = \frac{uV}{6.1} = \frac{uV_0}{4.16}.$$

These expressions give results which check with those obtained in the preceding paragraph.

When a car starts with its highest ratio gear meshed it is convenient to regard the motor speed as gradually increasing from zero to normal. The tractive force meanwhile remains constant. As soon as full motor speed is reached the gear should be reduced, else the accelerating car and fixed gear ratio will raise the motor speed above normal; or, to regard the matter in another way, the car will cease to accelerate, not because the motor power is insufficient, but because the motor cannot run any faster. Assume the change of gears to be made instantaneously

Then at the instant of changing the gear the acceleration of the car will be instantly checked and will again gradually increase under the action of the accelerating tractive force, but less rapidly than it did before.

This is represented in Fig. 3. If the limit of tractive force is 12 units, the car will increase its velocity from a to b, starting at rest, under the action of the tractive force due to the highest gear ratio. The curved line represents the law of constant motor output—RESISTANCE × VELOCITY = A CONSTANT. As soon as the line a b touches this curve, a change of gear is made. The tractive force now drops, say, to 8 units, along b c, but acceleration immediately recommences and we again approach the limit curve along c d. If we have three sets of gears still, the similar actions d e, e f, f g, g h, h j, j k follow until we reach that velocity (at k) at which the resistance due to the air is sufficient to absorb the whole tractive force, even without any acceleration.

Suppose our gear system were a simple pair of cone pulleys, as in Fig. 4. The tractive force might then be continuously varied so that we should be working along the limit curve itself, in Fig. 3. This would be accomplished by gradually shifting the cone belt in Fig. 4 from a to b. It would be necessary, however, to first reach the limit curve along some such line as a b, Fig. 3. But even this line could be indefinitely shortened by making the ratio of diameters of driven and driving cones very great at the starting end a, Fig. 3, because the limit curve approaches and finally coincides with the resistance axis in Fig. 4, at very high resistances and low velocities.

Starting Smoothly or Rapidly

With a series of gears, as in an automobile, perfect smoothness in starting is impossible; but there will be the least shock when the number of gears is large, the change from first to last is progressive, and the first gear has a high ratio. If the first ratio is too high, too many gears would be necessary, so that 10 or 12 to 1 is commonly employed in order that the total number of forward gears shall not exceed three.

The most rapid acceleration occurs as maximum horsepower is developed: i.e., while traversing the limit curve in Fig. 3. The greater the number of gears, the more closely and continuously is this curve approximated, and the more rapidly does the car attain its full speed.

The following conclusions seem warranted: Let subscripts denote respectively the grade and level conditions; then

$$R_G = m\,k + 0.00126\,A\,V_G^2 + c^*, \qquad (IX)$$

$$R_L = 0.00126\,A\,V_L^2 + c^*, \qquad (X)$$

*Equivalent resistance due to friction, in lbs.

$$H.P._G = (m\,k + 0.00126\,A\,V_G^2 + c)\,V_G \div 550,$$

$$H.P._L = (0.00126\,A\,V_L^2 + c)\,V_L \div 550,$$

$$u_G = r_G \div N_G = \frac{w\,r_G}{230\,V_G},$$

$$u_L = r_L \div N_L = \frac{w\,r_L}{230\,V_L}.$$

These lead to the two final forms, if $r_G = r_L$,

$$\frac{u_G}{u_L} = \frac{V_L}{V_G};$$

THE GEAR RATIOS ARE INVERSELY AS THE CAR SPEEDS; and, further, if maximum conditions are specified for both grade and level,

$$V_G\,(m\,k + 0.00126\,A\,V_G^2 + c) = V_L\,(0.00126\,A\,V_L^2 + c)$$

$$0.00126\,A\,(V_G^3 - V_L^3) + c\,(V_G - V_L) = -V_G\,m\,k \qquad (XI)$$

Application of Formulae

Returning to the car in question, if it is to have a motor capable of developing 36 1-2 horsepower, there is no reason why the speed limit on the level road should be kept down to 45 miles per hour (65.9 feet per second). Applying Equation XI,

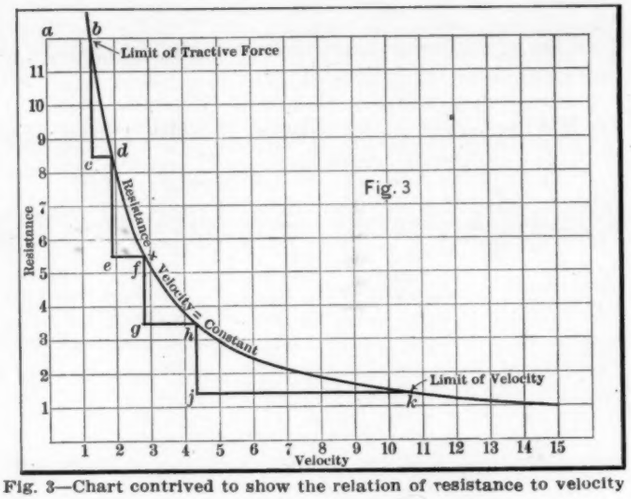

Fig. 3—Chart contrived to show the relation of resistance to velocity

$$0.00126 \times 25\,(51.2^3 - V_L^3) + 50\,(51.2 - V_L) = -51.2 \times 3300 \times 0.08,$$

$$4220 - .0315\,V_L^3 + 2560 - 50\,V_L = -13550,$$

$$V_L^3 + 1585\,V_L = 643000,$$

$$V_L = 80;$$

the attainable speed on a level road is then 80 feet per second rather than 65.9 feet, and the resistance at this speed being

$$(0.00126 \times 25 \times 80 \times 80) + 50 = 251 \text{ lbs.},$$

the horsepower corresponding is

$$\frac{251 \times 80}{550} = 36.5,$$

as for the grade condition. The "high" (low ratio) gear will now be obtained from

$$251 = \frac{27.7 \times 111 \times u}{34},$$

$$u = 2.79.$$

The car will be properly designed, from the present standpoint, if the second and third gear ratios are, respectively, 4.32 : 1 and 2.79 : 1. If we increase these ratios the required car speeds will be attained only at excessive piston speeds. If we decrease them the tractive power will be insufficient and the required speeds will not be attained.

Local conditions will determine whether grade climbing or level speed ability is more important. The resistance under the decisive power condition should be computed from Equations IX or X, the necessary gear ratio thereupon determined for maximum revolutions per minute of motor, and the cylinder dimensions fixed in accordance with Equation VIII, other constants being used if preferred. Under the alternative specified condition the maximum speed and grade for the car should not be independently assumed; but Equation (XI) should be used to determine the best possible performance.

The fundamental expression for determining gear ratios is $V = \frac{w\,r}{230\,u}$ or $V_o = \frac{w\,r}{337\,u}$. In the last, for w = 34, 9 = 1500, u V_o = 151.5. The "high" gear for a maximum speed of 50 miles per hour will then be 151.5 + 50 + 3.03, and the ratio for this gear will vary inversely as the maximum speed. The determination of velocity maintained under alternative conditions from Equation (XI) leads at once to the selection of a proper second gear. The third gear should be of such ratio as acceleration conditions may suggest. The reverse gear ratio should be at least as great as the third (lowest) gear forward, since a car must have positive backing power under all conditions and at low speeds.

Shown on Some Foreign Cars

AN EXAMINATION OF SOME OF THE FOREIGN MAKES OF AUTOMOBILES PRESENTS IDEAS THAT ARE WORTH GIVING A MOMENT'S THOUGHT BY DESIGNERS

WHILE it is not necessary to go abroad for ideas in connection with the making of automobiles, it remains for automobile engineers to keep abreast of the times, and it is only possible to do so if the practices of the foreign makers are carefully watched and the good things that they bring out are examined with a critical eye for comparison with the work that is done in our own shops. It is even a good plan to send the "engineer" to Europe once a year with the expectation that he will come home rested and recouped; with just the chance that he will bring home an idea or two that will fit in with the plans of the new year.

It will be appreciated how good it is to use every good idea in a timely way, but it is a great mistake for automobilists to assume that every good idea should be used, even though, like a "sore thumb," it gets in the way. Among designers it is well appreciated that a good idea becomes a bone of contention, or better yet, a bad thing to employ, unless in the original plan it is duly used. Let us have all the good ideas that we can get if they fit, but let us not try to use them just because they are "discovered."

In addition to these illustrations of foreign ideas there were quite a number as previously published in THE AUTOMOBILE, but this is not to say that they are not to be found in American cars to whatever extent they have proven to be efficacious. The idea will occur to some to observe how thoroughly the latest and most approved methods are being used on both sides of the "pond," but there are distinctions to be made in any event. If a plan is worked out for cars as it is to be employed on automobiles in America, when this plan is considered in connection with the design of foreign automobiles, it may be discovered that the scheme has objections on account of local conditions. It is for this reason that there are differences, at least in detail, between American and European designing work—these differences are justified.

The most noteworthy trend in foreign design is to "clean things up." The Continental designers are striving to give the appearance of simplicity, and they are succeeding. They have come to realize that nothing pleases either the layman or the skilled automobilist more than simplicity of design. All can remember the time when the mechanism of the big car frightened or awed every beholder, for there were interlocks galore and governors and a maze of small rods and springs. To-day all is pleasingly different, and any extra parts that are going on have very definite functions in the good examples of foreign cars.

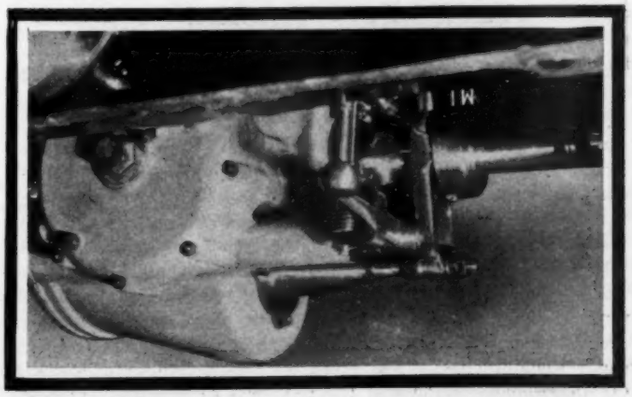

Fig 1—Renault brake adjustment (viewed from below the frame)

As an example along this line mention is made of the transmission brake adjustment on the Renault as shown in Fig. 1. On the right side of the car immediately under the footboard is a T-head handle, the turning of which adjusts the brake. This adjustment is obtained by means of using two levers on the brake shaft. One is short and in design is practically a steering sector. The other is long, and on it is arranged a short worm held in a U-shaped yoke, the yoke, of course, being integral with the lever. The stem of the T passes through the worm, and is either squared or held by sliding key, so that they must rotate together. Grooves have been cut across the bottom of the yoke, which hold a pin, driven through the stem of the key handle. Between the upper end of the stem of the T and the top of the yoke a spiral spring is placed. It will be seen that the spring keeps the cross-pin always in one of the grooves, so that the brake adjustment is always locked. The short lever is keyed to the shaft, while the long lever is mounted free, so that any turning of the adjusting handle changes, through the worm gear, the angle between the two levers, thus securing adjustment. While this idea of brake adjustment is not an altogether new one, yet so nicely is it designed with respect to convenience and ease of operation that it at once attracts and pleases. One can almost believe that the designer of this adjustment tried himself to adjust a brake of the usual type, and after removing the mud and grime from his clothing resolved to design something that is really convenient.

Another pleasing design noticed on this brake mechanism was the carrying of the brake shaft directly through the transmission case instead of on separate brackets. As the shaft runs fore and aft and is fitted with the brake cam at the rear end, this construction works out very nicely and gives the much desired appearance of simplicity.

A design such as this is not only admirable mechanically, but it has a very considerable value from a sales point of view.

The Renault, of course, continues the sloping hood, with the radiator attached to the dashboard. One feature not usually seen was the running of oil tubes directly from the oiler to both transmission case and rear axle. For supplying oil to the forward universal joint on one model of the Renault a tube of some half-inch diameter had been run to the side of the frame where it there made connection with an oil cup that was 2 1-4 inches in diameter. This oil cup through its accessibility and size really invited lubrication.

On the very newest model of the car that was staged several days after the show had opened a somewhat different arrangement was found. This consisted of a horizontal shutter as shown in Fig. 2, very conveniently opened by a lever, which permitted the oil flowing directly to the part to be lubricated. The motor of the Renault is carried on two pressed-steel cross members which go completely under the crankcase, oil pan and all. They give a four-point support and are placed at about one-sixth the length of the case from each end. The magneto is driven through spiral gears and the magneto shaft, as shown in Fig. 3, as is usual in Renault construction, runs across the crankcase. This location of the magneto makes it wonderfully accessible. The distributor for the magneto is carried separate from the magneto itself, thus eliminating magneto gears and simplifying construction. The De Dion also makes use of a spiral gear drive for the magneto, with the driving shaft at right angles to the crankshaft. The fan-driving belt on this car was conspicuous

on account of its width of 2 inches. The De Dion designers probably realized that this ample belt width would appeal to those who have lost many dollars' worth of time in attempting to repair a fan belt worth in itself less than a dollar. The radiator on this car was supported on spiral springs, which were nicely covered or rather concealed by flaps or doors of brass hinged to the radiator as shown in Fig. 4. A very inexpensive and excellent hood catch was noticed. It consisted of a spiral tension spring, with a T-head brass catch at one end for engaging with the hood, and a simple sheet steel fastening attached to the frame side. The entire hood catch comprised one spring, one handle, one piece of sheet steel bent L-shape and two screws. The De Dion uses two tubular frame cross-members as shown in Fig. 5, one for carrying the rear portion of the subframe and the other for taking the twisting action of the frame at the front brackets for the rear springs. The subframe itself was of hairpin shape, with one point of support at the forward end. Two brackets, dropped from the cross tube, completed a three-point power and transmission support. The De Dion continues its most excellent three-plate clutch, which seems proof against both use and abuse. A very clever design was seen on one of the smaller cars of this make. The waterjacket cover plates had tubes cast integral. These tubes, coupled together with a suitable union, entirely dispensed with an expensive water outlet manifold, as shown in Fig. 6, and the appearance of the car was in nowise cheapened. Another example of European thrift and ingenuity was the hood hinge on the Vinot-Deguinand, as shown in Fig. 7. The hood was not provided with a piano type hinge, but was made in two separate parts. Connecting the radiator and dashboard a strip of flanged sheet metal was run just under the hood. This strip was about 1 1-2 inches wide, and carried four hooks, such as would be made by cutting the link of a chain through one side and spreading it. The hood sides were finished with rolled edges. Small square holes had been punched in two places on each of the hood sides so that they could be placed over the hooks, which, conforming in shape to the rolled edge, gave an excellent hinge action, with the advantage of instantaneous removal of either or both sides of the hood. This design was really meritorious, for at less expense than the usual construction it accomplished more.

An anomaly was noticed in the Salon exhibit of the S. P. O. automobile where the statement was heard that the Wasson piston ring, American made, had enabled increased speed to be obtained with this car. The transmission on the S. P. O. is a nice example of compact design. The "Raceabout" type quite looked its name, for its appearance was attractive and "snappy."

The Napier car was fitted with Rudge-Whitworth wire wheels, as shown in Fig. 8, which are now being extensively used in England. These wheels are interchangeable for either front or rear, and as the change is easily effected demountable rims are unnecessary. To Benz belongs the credit of designing a hood which conforms with the now popular type of torpedo body. This hood tapers both top and sides, so that there is no marked offset where hood and body join. Although others have attempted this none has seemed to give the proper effect. On the Itala four-cylinder of 3 3-4 bore by 4 1-2 stroke no fan was used other than one in the flywheel. A simple type of slightly universal joint made the connection between the clutch shaft and the transmission. This joint consisted of a tube, sawed or slotted at each end, with the slots at 90 degrees apart, and two pins with flattened sides driven through the clutch and transmission shafts respectively. In the operation of the clutch the clutch shaft itself moved, but it was stated that there was no difficulty in releasing the clutch even when the motor was developing its full torque. On the Itala the whole power plant and transmission are on a subframe, removable by taking out four bolts. The small Renault chassis was fitted with underhung rear springs. On the Renault limousines the roof was built with a transom which appeared to be a pleasing innovation, and also gave ventila-

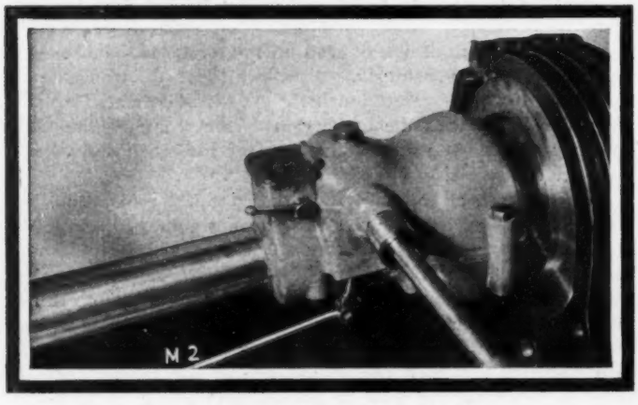

Fig. 2—Renault oiling door of neat design

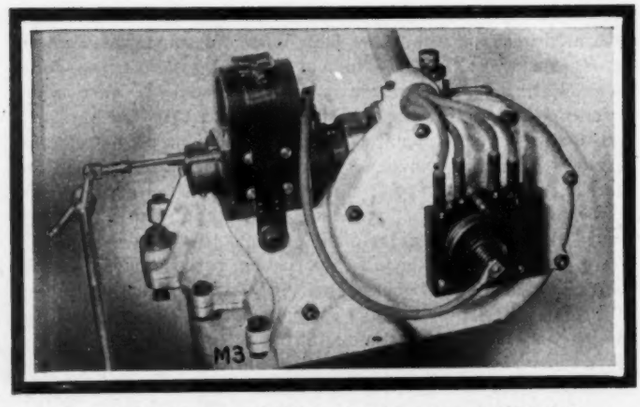

Fig. 3—Renault magneto drive, showing separate distributor

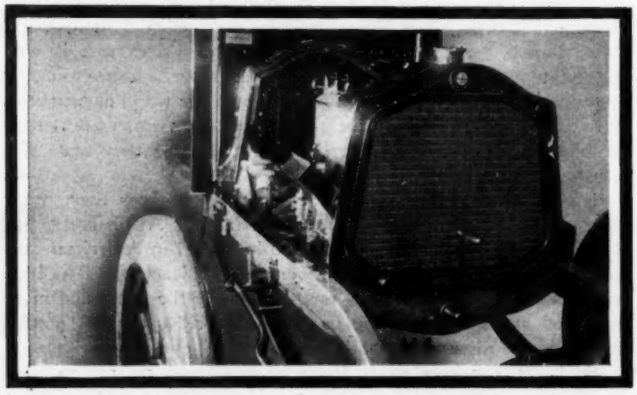

Fig. 4—De Dion spring radiator support and hood catch

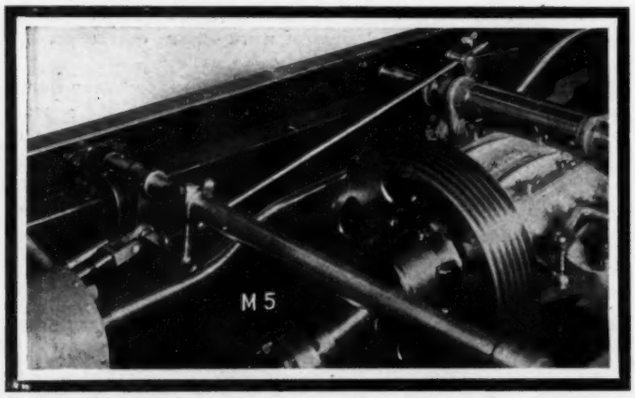

Fig. 5—De Dion tubular cross members

tion in abundance. One of the smaller Renaults, the 12-16 horsepower, had a fore-door limousine body, built with a hooded dashboard. This car was small enough to give the appearance of cosiness, and so graceful in its lines as to have absolute distinction. It seated only four, including the driver, and had no partition back of the front seats, evidently having been designed for the owner-driver. On some of the limousine bodies double window frames were fitted, one frame having glass and the other a fine mesh wire gauze. This feature should be much appreciated by those who like fresh air, but dislike dust. The gauze windows will probably find their greatest use in the Spring and Fall, when dust protection is needed, and yet fresh air is desired. The most

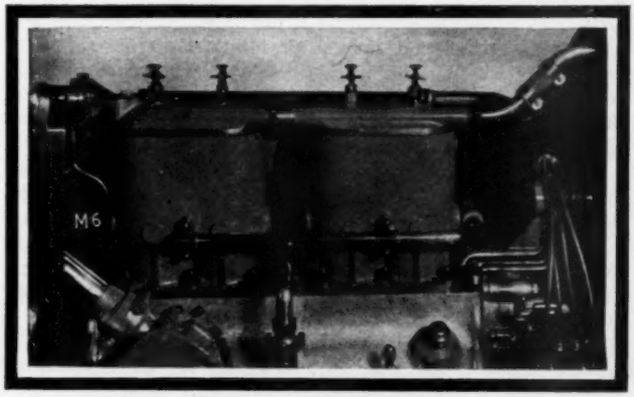

Fig. 6—De Dion scheme to eliminate water outlet manifold

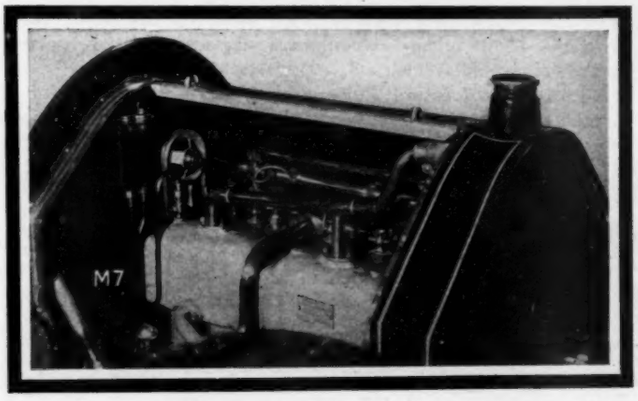

Fig. 7—Vinot hood hinge allows the hood sides to be removed

recently imported Renault chassis had, at the top of the steering tube, a knurled knob that when turned to different positions controlled the admission of hot or cold air to the carbureter. On this chassis the individual oil leads to transmission and rear axle had been replaced with lever-operated trap doors accessibly placed. The lever operating the oiling doors, when pushed to its lowest position, locked the door closed by toggle action. The Saurer compressed-air starter was shown on the largest chassis, and the catalog stated that an electric self-starter could be furnished for the 10-12 and the 12-16-horsepower cars. On the newest chassis it was noticed that the rear springs were underhung.

At the Importers' Show it was most interesting to observe the general trend of foreign design. The European designer seems to study human nature as well as mechanisms. As automobiles are primarily built to sell, he makes just as much effort to find what the buyers like as he does to design the device itself. It is entirely probable that the managements of many of the European companies realize the importance of having the engineering department and the sales department in the closest possible touch. A very successful manager of the American selling branch of one of Europe's largest manufacturers stated that the factory invariably accepted suggestions from the selling organization, and

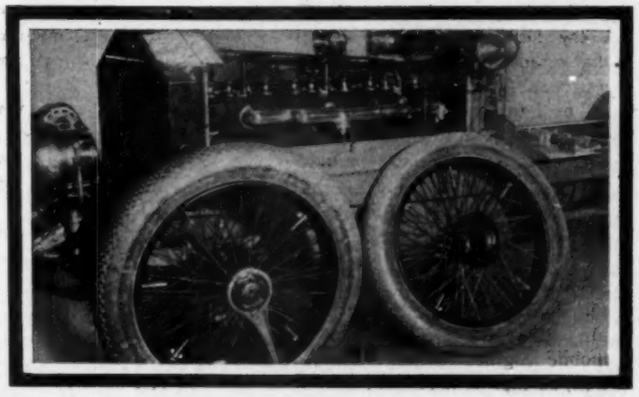

Fig. 8—Rudge-Whitworth wire wheels used on the Napier

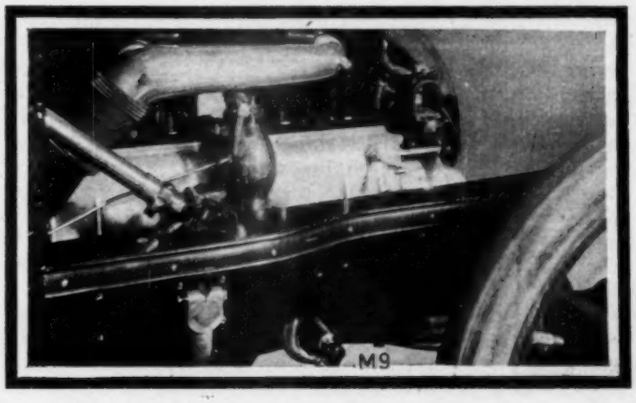

Fig. 9—Showing frame offset just back of front wheels

mentioned two instances where business had been much facilitated by alterations made. It is true without question that the European designers are dispensing with unnecessary mechanisms. Every addition made to the basic chassis parts needs no designer's argument in its favor; the prospective buyer will himself argue for it and commend it, for it is placed for his convenience, and has been designed after a careful study of his wants. Somewhere behind these foreign cars, which both attract and please us, is most competent general management.

No radical changes were seen. On the latest frames the offset is just back of where the front wheel strikes in, as shown in Fig. 9. When it is remembered that frames usually break just back of the dashboard, due to the combined effects of load and the offset usually located there, the idea of the forward offset will at once appeal. The cellular cooler does not seem to be holding its own, for many radiators were of the tube and fin class. The three-quarter elliptic rear spring appears standard construction. Electric lighting is slowly but surely coming to the front, although no generators were seen fitted to any of the cars at the show. However, from electric side and tail lamp equipment with storage battery it is only a step to complete electric lighting with headlights and generator. With the exception of the Silent Knight engine shown in the Knight-Daimler chassis no novelties affecting the basic ideas of conventional automobile design were on exhibit. It was noticed that almost all of the bodies were of American build, which would indicate that our body builders have been able to entirely please in body construction. In fact the work now being done with sheet aluminum in this country is little short of marvelous. Quinby had a very handsome fore-door limousine body on exhibition with details most excellently planned, while the work of other American makers seemed above reproach.

It may with justice be said that the better foreign cars give an impression of simplicity of mechanism coupled with a multiplicity of little things done well that are all nicely calculated to

catch the eye of the intending purchaser. Little economies are everywhere apparent, but they are not the "penny wise" economies that offend, but have been brought about by good brainwork and much study on the part of those responsible.

The Saurer truck, which is built in Switzerland, has two features that should arouse the envy of other motor car makers. One of these is the motor brake, and the other is the self-starter. When a truck weighing three tons and carrying a load of five tons is to be suddenly stopped from 12 or 15 miles an hour there is some work to be done. Taken on brake linings and drums this work means wear. The Saurer, by means of a sliding camshaft, makes the engine work as an air compressor, and thus gets braking action. The engine is well adapted to this work, for what air compressor is as well fitted to take care of heat as the automobile engine? The ordinary friction brakes are provided as well, so that both or either can be used. The self-starting device (Fig. 10) is not new nor is the motor brake. The Renault applies the Saurer starter under license, and Saurer has used it for several years. The self-starter is actuated by compressed air. This air is compressed by a pump on the clutch transmission shaft, and stored in a tank. The starting device consists of a rotary distributing valve, and a manifold to distribute the air to each cylinder. The rotary valve first opens the way for the compressed air to push down one piston, and then another, just as the explosion of gas later pushes the pistons down. The air pressure, however, is much lower than the pressure of explosion. On a vehicle having pneumatic tires the same compressor inflates them.

Garden Show Sets New Marks

Never in the eventful history of motordom has there been such an exhibition as the recent Eleventh National Automobile Show, under the auspices of the A. L. A. M., at Madison Square Garden. In point of attendance, general interest on the part of the public, business for exhibitors and all-around satisfaction the late show has never been approached in the metropolitan field.

Unlike the weather conditions that obtained during a majority of shows that have gone before, the weather was favorable throughout the two weeks. This may have had some effect in adding to the weight of the attendance, but it may be said with confidence that nineteen out of every twenty who did attend would have done so in the face of anything short of a blizzard.

The opening was a wonderful success, with such a crowd present as never before assembled in the Garden. It has been estimated that at one time on the opening night there were not far from 25,000 persons in the amphitheater, basement and balconies. During the first week something over 173,000 visited the show. There were six full days and Saturday evening of the preceding week included in this computation. Figuring that Saturday as a full day, the attendance averaged close to 25,000 each session.

Compared with the attendance of the previous record show, this indicates an increase of over 40 per cent. More business than ever before was done during the week and trade was so lively for the accessory dealers and manufacturers who had space that there was a big rush for a renewal of contracts for the final week of the show.

Truck week proved an astonishing success. The count showed that about 67,000 persons visited the Garden during the time the commercial wagons were on display.

This would indicate an average attendance per day of slightly over 11,000. As the week saw the first truck show on record, there is no basis of comparison by which this army may be measured.

The affair, covering both weeks, was well managed and it is not too much to say that dissatisfaction was entirely absent. Both exhibitors and public appeared to be well pleased.

The feature of the final week was the intense business character of the inspection of the trucks. Competent judges of industrial shows state that so much attention has never been given the details of any exhibition as was accorded the displays of the commercial vehicles.

Already talk of future shows is being heard, but nothing of a definite character has been reported as to the annual exhibition of 1912.

French Statistics Presented

W. H. BRADLEY GATHERS FIGURES FOR THE PURPOSE OF SHOWING THE STATE OF THE ART IN THE FRENCH CAPITAL

ACCORDING to semi-official statistics published on the recent Paris Automobile Salon, the average horsepower of the 117 chassis exhibited by 84 manufacturers was 12, and the average bore of the cylinders was about 80 millimeters, or 3.1 inches. In 1906 the average bore was 95 millimeters, the decrease being largely due to the increased ratio of stroke to bore. The statistics only deal with bare chassis, complete cars being ignored, for the most improved models were generally shown in chassis form only. The highest ratio of stroke to bore was on the Sizaire-Naudin car, with 70 by 170 millimeters, Hispano-Suiza had 80 by 180 millimeters, and Gregoire 80 by 160 millimeters. Out of the total number of chassis exhibited only 3 per cent. had a single cylinder, 1 per cent. had two cylinders, 77 per cent. had four cylinders, 18 per cent. had six cylinders and 1 per cent. had eight cylinders. The 77 per cent. of four-cylinder models were divided up as follows: Six per cent. with separate castings, 32 per cent. with the cylinders in pairs, and 39 per cent. with all four cylinders in a single bloc. Of the 18 per cent. of six-cylinder motors 9 per cent. had the cylinders in three sets of two, 6 per cent. had two sets of three, and 3 per cent. had a bloc casting. The monobloc four- and six-cylinder models represented 42 per cent. of the total, compared with only 8 per cent. in 1906 and none at all in the year 1904. Motors with enclosed valve stems represented about 30 per cent. of the whole. Ignition by high-tension magneto was found on 98 per cent. of the chassis; in 1906 it was only found on 72 per cent. of the cars, and did not exist in 1902. Double ignition was only found on about 5 per cent. of

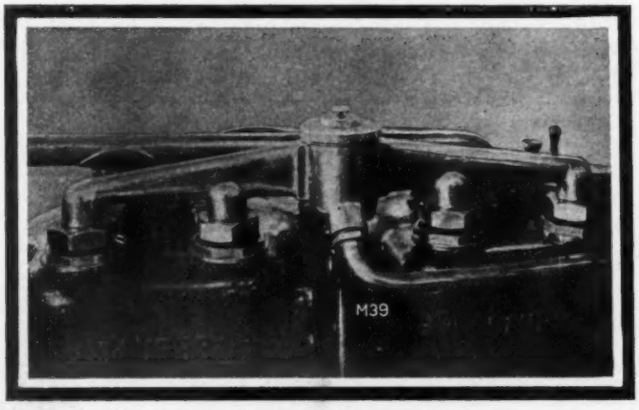

Fig. 10—Showing the Saurer self-starter

the total cars, and these mostly of foreign construction. There was a tendency this year toward variable ignition advance.

Thermo-syphon cooling has made remarkable progress, as is shown by the fact that it was found on 56 per cent. of the chassis this year, compared with 14 per cent. in 1906. The pump was used on 44 per cent. of the cars, compared with 86 per cent. four years ago. In connection with thermo-syphon cooling must be noted a tendency to place the radiator back of the motor. The show was about equally divided in the matter of clutches. The metallic section was responsible for 46 per cent. multiple-disc or dry-plate clutches, and 52 per cent. were leather cone clutches. These latter could be subdivided as follows: Ordinary cone, 32 per cent.; inverted cone, 20 per cent. There were a few isolated examples of friction drive. Although there is a strong tendency toward four-speed gear boxes, the three-speed gear set is the most frequently found, for it is used on the many light cars which do not need the extra gear and on most of the six-cylinder models which can dispense with it owing to the greater suppleness of the motor. The proportions were 5 per cent. with only two speeds, 51 per cent. with three speeds, and 44 per cent. with four speeds.

Shaft drive was employed on 94 per cent. of the chassis, compared with 63 per cent. in 1906. Chain drive, which was employed on 62 per cent. of the cars in 1902 and 37 per cent. in 1906, has dropped down to 3 per cent. for the year 1910. Of these 3 per cent. nearly all had the chains encased. The De Dion type of transverse cardan shaft was found on the Bazelaire and Pilain chassis, and worm drive was used on the English Daimler and a 20-horsepower Darracq model.

A variety of methods was adopted for anchoring the rear axles. On 57 per cent. of the chassis there was neither torque tube nor radius rods, the effort being absorbed by the springs only. Other methods employed were radius rods below the frame members, as on the Brasier and Rochet-Schneider, and a central tube terminating in two arms attached to the transverse frame member carrying the gear box, as on the Fiat and Panhard-Levassor models. A few, as Mercedes and Horsch, employed a triangular arrangement of rods. Torque rods were of two main classes, a tube carrying the propeller shaft with a variety of methods of attachment, and a triangular structure, either of pressed steel or two separate tubes. La Buire and Cottereau were the only firms having a double type of rear axle allowing the rear wheels to be canted.

Owing to the great variations in detail it was impossible to draw up accurate statistics regarding rear axle construction. Not much change had been made in the matter of brakes. Isotta-Fraschini and Rolland-Pilain employed front wheel brakes. There was a tendency to rib the drums of internal brakes, or to carry ribs on the shoes in the case of external brakes, a good example of this being found on the Renault. A compensating mechanism was found on about half the chassis, and in a few cases (Renault and Lion-Peugeot) a differential mechanism was employed to transmit equal braking effort to the road wheels. Wire wheels were only represented on 6 per cent. of the Continental products.

Chain drive for the camshaft or shafts and the magneto shaft was employed on the following makes: La Buire, Gregoire, Aster and Sizaire-Naudin. Ball-bearing crankshafts were found on motors presented by Bozier, Darracq, Delage, Hispano-Suiza, Pipe, Saurer, Sautter-Harle and Turicum.

Officers for New A. M. A. of A.

Quarters for the newly-formed Automobile Manufacturers' Association of America have been definitely selected, but formal announcement of their location has not yet been made. The suite where headquarters of the new body will be located is on Fifth avenue.

An annual show will be the chief industry of the association and it will be held in the new Palace building, which it is expected will be completed by next Fall.

Coming Events

CALENDAR OF FUTURE HAPPENINGS IN THE AUTOMOBILE WORLD THAT WILL HELP THE READER KEEP HIS DATES STRAIGHT—SHOWS, ANNUAL MEETINGS AND OTHER FIXTURES

Jan. 14-28.....Philadelphia Annual Show, Philadelphia Licensed Automobile Dealers' Association, First and Third Regiment Armories.
Jan. 28-Feb. 4...Chicago Coliseum, Tenth Annual National Automobile Show Under the Auspices of the National Association of Automobile Manufacturers, Inc., Pleasure Cars and Accessories, Exclusively.
Jan. 30-Feb. 4...Troy, N. Y., Annual Show, Troy Automobile Club, State Armory.
Feb. 1-4.....Worcester, Mass., Annual Show, Licensed Automobile Dealers Association of Worcester.
Feb. 6-11.....Chicago Coliseum, Tenth National Automobile Show Under the Auspices of the National Association of Automobile Manufacturers, Inc., Commercial Vehicles, Pleasure Cars, Motorcycles and Accessories.
Feb. 6-11.....Buffalo, N. Y., Ninth Annual Show, Automobile Trade Association of Buffalo, Broadway Arsenal.
Feb. 9-11.....Davenport, Iowa, Second Annual Show, Davenport Automobile Club.
Feb. 13-18.....Washington, D. C., Annual Show, Convention Hall.
Feb. 13-18.....St. Louis, Mo., Fifth Annual Show, Coliseum.
Feb. 13-18.....Winnipeg, Man., First Annual Show, Winnipeg Motor Trades Association.
Feb. 13-19.....Kansas City, Mo., Annual Show, Motor Car Trade Association.
Feb. 14-19.....Dayton, O., Second Annual Show, Memorial Building.
Feb. 15-18.....Grand Rapids, Mich., Annual Show.
Feb. 18-25.....Minneapolis, Minn., Annual Show, Minneapolis Automobile Show Association, National Guard Armory.
Feb. 18-25.....Brooklyn, N. Y., Annual Show, Brooklyn Motor Vehicle Dealers' Association, 23d Regt. Armory.
Feb. 18-25.....Binghamton, N. Y., Second Annual Show, Binghamton Automobile Club and Chamber of Commerce, State Armory.
Feb. 18-25.....Newark, N. J., Fourth Annual Show, New Jersey Automobile Exhibition Co.
Feb. 18-25.....Albany, N. Y., Annual Show, Albany Automobile Association, State Armory.
Feb. 20-25.....Cincinnati, O., Annual Show, Cincinnati Automobile Dealers' Association.
Feb. 20-25.....Portland, Me., Sixth Annual Show, Auditorium.
Feb. 20-26.....Omaha, Neb., Annual Show, Omaha Automobile Association.
Feb. 21-25.....Baltimore, Md., Annual Show, Automobile Club of Maryland, Fifth Regiment Armory.
Feb. 22.....Cleveland, O., Annual Show, Cleveland Automobile Show Company.
Feb. 24-27.....New Orleans, La., Annual Show, New Orleans Automobile Club.
Feb. 25-Mar. 4...Toronto, Ont., Automobile Show, Ontario Motor League.
Feb. 25-Mar. 4...Kansas City, Mo., Fifth Annual Show, Kansas City Automobile Dealers' Association, Convention Hall.
Feb. 28-Mar. 4...Sioux City, Iowa, Second Annual Show, Sioux City Automobile Dealers' Association, Auditorium.
Mar. 4-11.....Boston, Mechanics' Building, Ninth Annual Show, Licensed Automobile Dealers' Association.
Mar. 7-11.....Des Moines, Ia., Third Annual Show, Des Moines Automobile Dealers' Association, Coliseum.
Mar. 14-18.....Syracuse, N. Y., Third Annual Show, Syracuse Automobile Dealers' Association, State Armory.
Mar. 14-18.....Denver, Col., Annual Automobile Show, Management Motor Field, Colorado Auditorium.
Mar. 15-18.....Louisville, Ky., Annual Show, Louisville Automobile Dealers' Association, First Regiment Armory.
Mar. 18-25.....Pittsburg, Annual Show, Pittsburg Auto Show Association (Inc.), Exposition Hall.
Mar. 25-Apr. 1...Buffalo, N. Y., Fourth Power Boat and Sportsmen's Show, Sixty-fifth Regiment Arsenal, Buffalo Launch Club.
Mar. 25-Apr. 8...Pittsburg, Fifth Annual Show, Duquesne Garden, First Week, Pleasure Cars; Second Week, Commercial Trucks. Automobile Dealers' Association of Pittsburg, Inc.
Apr. 1-8.....Montreal, Can., Automobile and Motor Boat Show, Automobile and Aero Club of Canada.

THE AUTOMOBILE

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"WHAT the buyer wants to know." This subject is being handled in THE AUTOMOBILE this week. Reduced to its simplest terms, the buyer of acumen knows his need, and then he has to ascertain who can fill the want. The purchase of an automobile is rendered difficult due to the so-called salesmanship that passes current not only in the automobile fraternity but in every art outside of the steel, sugar, and one or two other trades where the vendor seems to be able to decide upon what the purchaser will have to take or go elsewhere. There is some virtue in "sugar methods"; they save time; mistakes are less likely to creep in, and to the purchaser who knows what he wants it is a mere matter of going to the place where they make it. When a well-dressed, suave, poorly informed individual is given the task of disposing of automobiles, he collects a carload of alleged selling points, and, gatling-gun fashion, he fires them at the prospective whose sole misfortune lies in the fact that all he wants is an automobile. It would be a great step in the direction of economic progress if the salesman would tell the prospective just what he has to sell, permitting of the ready purchase of the car, thereby getting possession of funds that are necessary to his well-being, on a business basis.

* * *

"ON a business basis." It is an ancient fiction that a business man can toy with license far beyond the point where a risk would become imminent were the same transactions traced to a person with a "pedigree." It is fortunate that automobile builders are training their representatives into the idea that a customer must be protected. It is no longer "business" to cheat. The new idea is based upon the value of a satisfied customer. Experience indicates that a customer is the easiest man in the world to send away in a contented state of mind; he either wants what he decides will be efficacious for him, or he desires that the seller shall stand behind that which he recommends as being better for the intended purpose. The seller has no right to induce a purchaser to change his mind, excepting with the understanding that the purchaser shall be protected to the fullest extent. The great department stores have grown up and prospered under the plan which permits any purchaser to return the goods if they are not as represented.

* * *

STANDING on the threshold of a marvelous increase in the automobile business, due to the impetus that is being given the freight automobile situation by the better understanding that merchants have of the capabilities of modern well-made cars devoted to this purpose, it remains for the builders of automobiles who should be, and probably are, better informed than merchants in the matter of the proper use of freight automobiles, to look well to what they do. The history of the passenger automobile industry should serve in the capacity of balance-wheel. In a recount, in a brief way, of the history of the automobile business, some of the older models are reproduced this week in THE AUTOMOBILE, and while they present a certain quaint appearance, and are likely to open the floodgates of reminiscence, the fact remains that they should serve as an object lesson to those who contemplate the building of freight automobiles. It is self-evident that these cars, most of which are less than 10 years old, were built under a poor conception of the necessary qualifications of passenger automobiles. Are we to start out at this late day and build freight automobiles with a poor conception of the requirement and of the cars that must fulfill the need? If so, the builders thereof will have a large percentage of their investments tied up in obsolete plans, patterns, templets and gauges, just at a time when it will be necessary for them to undertake the rebuilding of their product, and they will have to reassure merchants that the newer effort will be of permanent value.

* * *

WORM gear drives are coming into vogue for freight automobile work, due to the fact that the speed of the car on the road must be slow, and the speed of the motor must be relatively high. A secondary advantage may be traced to the noiseless performance of worm gears as compared with double reduction gears of other types, and it is worthy of note that the worm drive is highly efficient when the motor operates at a high speed, and a secondary shaft is driven at a low speed. Regarding the efficiency of a properly made worm gear, there is nothing to be said excepting in its favor, and referring to life, there are vast numbers of worm drives that have been in constant service under exacting conditions for twice as many years as the automobile business is old.

News Section

HAPPENINGS OF THE WEEK IN VARIOUS SECTIONS OF THE COUNTRY AS GATHERED BY THE 84 SPECIAL WRITERS AND CORRESPONDENTS OF "THE AUTOMOBILE"

What General Manager Alfred Reeves, of the A. L. A. M., Has to Say About the Future of the Commercial Vehicle and the Influence Thereon of the Recent Show—Death of Arthur N. Jervis, Publicity Manager for the Alco—Truck Week at the Philadelphia Show—Aftermath of the Detroit and Milwaukee Shows—Waiting for the Word to Open the West's Biggest Exhibition—News of the Preparations Being Made for the Local Shows Throughout the Country—Trade Brevities of All Sorts.

Reeves Gists Lessons of Truck Show

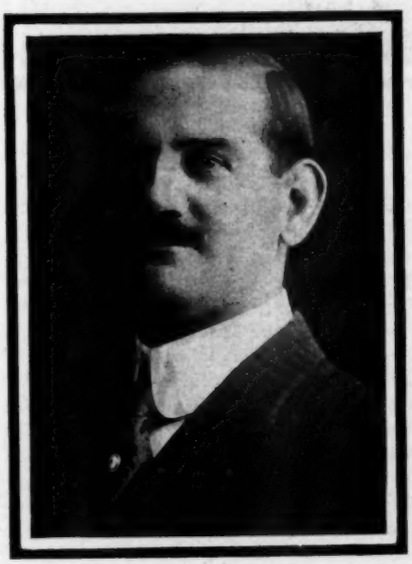
ALFRED REEVES, general manager of the A. L. A. M., in discussing the commercial or freight vehicle in relation to its development as shown in the final week of the recent exhibition at Madison Square Garden had the following comment to make through THE AUTOMOBILE:

"It is a moral certainty that this the first real show of the freight vehicle has proved to the American public that the motor truck has arrived. It has had the same effect on the business men of this country as the early shows had on the general public.

"Prior to the time the automobile became known to the bulk of the people, it was said that the motor car was a fad and the toy of the rich. Wrong ideas concerning the truck had permeated the minds of many business men and the recent show had the broad effect of familiarizing the merchants and municipalities with the truck, just as in the earlier days the general automobile shows familiarized the public with the passenger motor cars.

"The show was a success beyond the most optimistic ideas of the management. In the matter of attendance, which was between 10,000 and 12,000 a day during the whole week, it proved to be much greater than any of the early shows. In the business done by the exhibitors another striking success was scored.

"The feature of the show that would impress the ordinary business man with the most force was the extraordinary variety of cars, ranging from the smallest and lightest to the largest and heaviest that could be classed among motor trucks. Each maker seemed to have chosen a field all his own and as a consequence there was no apparent overdoing of the package delivery types nor of the five-ton giants.



Alfred Reeves, general manager A. L. A. M.

"Almost all the trucks shown were specially made for freight work and the made-over touring car that once masqueraded in the guise of a truck was agreeably absent. A most important feature from the viewpoint of the consumer was that the trucks displayed have had the benefit of four or five years' experience in actual practice and have been strengthened in all the weak spots that have been developed during that time. The matter of accessibility of parts has been considered carefully and will undoubtedly work out for greater economy.

"Even the tire problem has moved many steps toward solution. The truck of the future that will meet with favor at the hands of business men looking for service and economy will have to be inexpensive to maintain and operate.

"Unless the freight vehicle is capable of effecting a radical saving in the actual cost of transportation of merchandise, besides performing more quickly and completely, it will have trouble in supplanting the horse-drawn vehicle. Putting trucks into the service of business houses is a displacement proposition, but anyone who attended the show must feel that the truck is now in that position where it can demonstrate its value to such a degree that it will warrant any business house in installing it in place of horse-drawn vehicles."

Goodrich Company Elects Officers

AKRON, O., Jan. 23—At the annual meeting of the B. F. Goodrich Company, January 18, the stockholders heard an encouraging report of the business of the past year, when the volume transacted exceeded any previous year. The outlook for next year is exceedingly bright and an aggressive campaign will be carried on as in past years.

The directorate and officers for the coming year remain unchanged. B. G. Work was elected president by the directors; F. H. Mason, first vice-president; H. E. Raymond, second vice-president; C. B. Raymond, secretary and assistant treasurer; W. A. Means, treasurer; E. C. Shaw, general manager of works.

The stockholders re-elected the following directors: B. G. Work, George W. Crouse, F. H. Mason, E. C. Shaw, H. E. Raymond, C. B. Raymond, C. C. Goodrich.

American Motors Enters Field

INDIANAPOLIS, Jan. 23—The American Motors Company, a new corporation, has succeeded the American Motor Car Company, buying the property and plant, and will continue the manufacture of the American models.

With an authorized capitalization of $1,000,000 the new company has been incorporated, the incorporators being J. I. Handley, of New York City; James E. Kepperley and A. D. Ogborn, of Indianapolis. Mr. Handley has been elected president. V. A. Longaker, who was president of the American Motor Car Company, will continue with the company in an active capacity.

Mr. Handley, formerly vice-president of the United States Motor Company, of New York, will move to Indianapolis at once to assume the management of the new company. It is the new concern's intention to begin a vigorous advertising campaign.

Trucks Follow Pleasure Cars at Quaker Show

PHILADELPHIA, Jan. 21.—Getaway day for the gasoline pleasure cars was marked by an enormous crowd that flocked in ever-increasing numbers to both the First and Third Regiment Armories, and the first week of Philadelphia's Show closed in a blaze of glory. Having had their innings and been the cynosure of all eyes for the week these cars Monday give way to the electrics and commercial vehicles, which will hold the boards for the second and final week. The accessories exhibit, greatly augmented since the opening last Saturday night, remains, having been considered of sufficient importance to be continued throughout the two weeks.

With the closing of the first week, the scene shifts exclusively to the Third Regiment Armory, Broad and Wharton streets. Admittedly the most pretentious event of its kind ever held here, the public was quick to show its appreciation, which manifested itself in daily and nightly attendances that were only limited by the size of the armories, and there are no signs of abatement in the interest, a fact that augurs well for next week. Financially, in number of sales actually made and those in prospect, and in the number of visitors, all former efforts have been easily outdistanced.

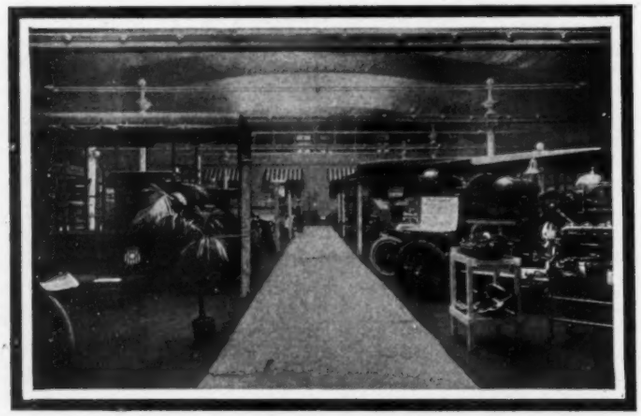
A fact worthy of observation during the week has been the large number of sightseers present—that is, persons who don't own cars, but who seized every opportunity of increasing their knowledge on the subject. It hasn't been so very long since automobile shows to the lay mind were considered part and parcel of those directly or indirectly connected with their manufacture, distribution or those fortunate enough to possess machines of their own, and that as far as the average citizen was concerned such exhibitions were not in his line.

But as far as the aforementioned average citizen was concerned this week, he was fully as much in evidence as his more fortunate brother. And to demonstrate that his tribe is increasing, any number of cases might be cited where a visitor to the Show, perhaps only perfunctorily interested before attendance, has emerged a "bug." And surely no Doubting Thomas could have visited either or both of the local armories this week without a lasting impression that the motor car as a means of transportation is an indispensable article. As illustrating the widespread interest in this year's show: It has been customary in preceding shows, and it was deemed advisable, to set apart a day during Show Week when, in order to limit the attendance to "prospectives" and to insure would-be buyers the attention commensurate with the important function of selection, double admission would be exacted. Wednesday was the day selected, and in consequence of the increased charge was dubbed "Millionaires' Day." Yet it is doubtful if this had a deterrent effect on any considerable number, for Wednesday was a banner day. And the fact that manufacturers have apparently reached such a stage of mechanical construction that the changes occurring from year to year make no appreciable difference in external appearance has tended to swing into line the man who, though he might be able to purchase one car, could not afford to buy a new model with each succeeding season, were radical changes to be made, and who would be sensitive to the gibes of sarcasm that formed the lot of the rider of an out-of-date bicycle when that vehicle was in its heyday.

Although Saturday the formal opening of the Show took place, Monday really marked the beginning, for on that day many exhibits that had formed a feature of the Madison Square Garden Show were installed. All told, there was a total of 54 different makes of cars on view, and as each exhibitor had more than one exhibit, and some as high as four or five, there were probably 150 cars in the two armories. And sharing honors with them were trophies that silently, but none the less eloquently, told of many a thrill. The sentimental value of an emblem that betokens superiority of endurance or speed is incalculable, and such prizes were at the Third Regiment Armory aplenty. Probably holding chief interest for Philadelphians was the Fairmount Park Road Race trophy which the big Chadwick No. 12, also on view, won in a gruelling finish by the narrow margin of six seconds. Then there were the Vanderbilt Cup, the Lozier 24-hour prize cup, the Indianapolis trophy, the Cobe trophy and many others, all of which attracted attention.

A total of 31 makes was represented at Broad and Callowhill

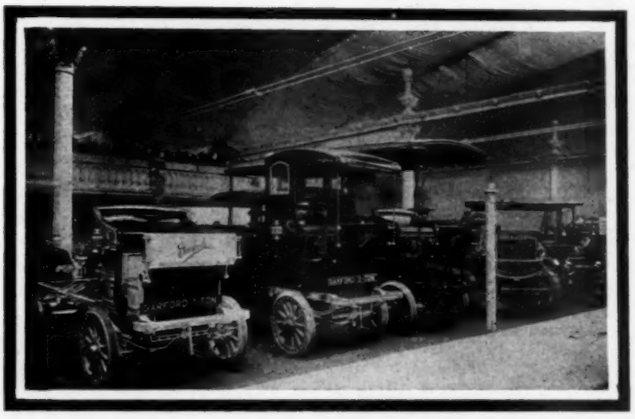
The Autocar exhibit, a local product, came in for a share of attention



Looking along the main aisle at the Philadelphia Commercial Show in the Third Regiment Armory

streets—Buick, Cadillac, Cartercar, Columbia, Courier, E-M-F "30," Everitt "30," Flanders "20," Garford car, Haynes, Hudson, the Hupmobile, Jackson, Kissel Kar, Knox, Marion, Maxwell, Mitchell, National, Oakland, Overland, Palmer-Singer, Peerless, Pierce-Arrow, Reo, Selden, Stanley, Stearns, Stevens-Duryea, Stoddard-Dayton and the Studebaker—and though the lack of a building sufficiently large to house the exhibition under a single roof is a matter to be regretted, free motor bus service between the armories quickly transported patrons from one show to the other, a very popular innovation that made an instant hit. Broad street has presented a most attractive appearance throughout the week, having put on gala garb in honor of the occasion. Particularly does this apply to the neighborhood of the First Regiment Armory, from this building south to the City Hall constituting Automobile Row. Vari-colored bunting and pennants decorated all the buildings, the individual exhibits of those companies necessarily barred from the Show, by reason of it being

exclusively of licensed cars, being invitingly on display. No car lacked its champions, and whether in view in either of the armories or privately shown, each had its quota of devotees, with the consequence that every car was "the best." Recent happenings in the motor world tended to add more than an ordinary attractiveness to some of these, principally the Otto and the Ford. Occupying a goodly portion of the spotlight at the present time, naturally the Ford automobile was the subject of attention, and the new models displayed at the local branch offices of the Ford Motor Company, No. 250 North Broad street, daily drew crowds. Here were conspicuously displayed, too, all the working parts of the Ford chassis in operation. The Fanning Motor Company is conducting a private show at Broad and Race streets, where a complete and comprehensive line of the Bergdoll car, a Philadelphia product, is on view. The Alpena, a newcomer here, made by the Alpena Motor Car Company of Alpena, Mich., is also among the numerous array of auxiliaries. The Eastern Motor Sales Company is the distributer of this car, with temporarily-established salesrooms at No. 1510 Chestnut street. Indeed, motor interest in Philadelphia is at flood tide, and many as are the exhibits inside the big armories, the number outside is legion. An incentive that has figured greatly this year has been the delightful weather. With days that were more like spring or fall than midwinter, every inducement was for the outdoors, which redounded to the benefit of the Show.



The Garford line was well represented

The number of different makes of cars on show at the Third Regiment was slightly less than at the First. Many of the higher-priced machines were here, and their immaculate appearance presented a beautiful contrast with the color scheme of white. All told, there were 23 makes—Alco, Autocar, Brush, Chadwick, Chalmers, Elmore, Locomobile, Lozier, Marmon, Matheson, Mercer, Oldsmobile, Packard, Pope-Hartford, Premier, Pullman, Rainier, Regal, Royal Tourist, Welch, White and Winton.

The Matheson exhibit was specially attractive to the admirers of the six-cylinder automobile and in fact all the companies that showed this type of motor received much attention.

Monday at noon an entirely different scene will be presented for public approval when the doors of this armory are thrown open for the final week. Trucks of every size, shape and capacity will divide attention with the silently-moving and graceful electric town cars, a representative list of both branches of the trade being assured. The following are the exhibits in the Commercial Vehicle section:

Alco, Longstreth Motor Car Company, 253 North Broad street; Autocar, Autocar Company, 249 North Broad street; Alden Sampson, United Motor Philadelphia Company, 207 North Broad street; Baker, C. A. Haines & Co., 2214 Spring Garden street; Brush, Oxford Automobile Company, 518 North Broad street; Commercial, Commercial Truck Company, 27th and Brown streets; Garford, Eldredge & Wagner, Odd Fellows' Temple, Broad and Cherry streets; Knox, North Philadelphia Automobile Station, 3425 North Broad street; Mack, Mack Brothers' Motor Car Company, Broad and Wallace streets; Packard, Packard Motor Car Company, 216 North Broad street; Peerless, Automobile Sales Corporation, 144 North Broad street; Pierce-Arrow, Foss-Hughes Motor Car Company, 201 North Broad street; Reo, Prescott Adamson, Broad and Spring Garden streets; Waverley, Waverley Electric Company, 2043 Market street; White, The White Company, 629 North Broad street.

Line-up of trucks and other commercials along the south aisle of the Third Regiment Armory

The electrics shown are:

Babcock, A. G. Spalding & Bros., 202 North Broad street; Baker, C. A. Haines & Co., 2214 Spring Garden street; Detroit, J. C. Parker & Son Company, 17 North 21st street; Rauch & Lang, General Motor Car Company, 227 North Broad street; Studebaker, Studebaker Brothers Company, 18th and Noble streets; Waverley, Waverley Electric Company, 2043 Market street; Woods, Woods Electric Garage, 21st and Market streets.

Milwaukee Show Set New Mark

MILWAUKEE, Jan. 23—The third annual Milwaukee show, January 14 to 20, established many new records for such expositions in Milwaukee. The attendance was 24,083 for five days and six evenings, or about 5,000 more than attended the six-day show in 1910. Reliable figures gathered from exhibitors show that 180 cars were actually sold at the exhibits, the total value of these being $550,000. Forty orders for trucks were taken by exhibitors, with a total value of $100,000. The number of pleasure cars exhibited was 193, giving a ratio of sales of nearly one to one. Forty trucks sold against 44 exhibited gives a like ratio.

So successful was the show that the Milwaukee Automobile Dealers' Association has already taken an option on the entire Auditorium for next year. The policy will remain practically unchanged, having been entirely satisfactory.

On Friday evening, the closing night of the show, the association, in co-operation with the Wisconsin State A. A. and Milwaukee A. C., entertained about forty members of the Legislature. Upon the arrival from Madison, the legislators were transported to the Hotel Pfister for dinner and then to the Auditorium. Many of them were enlisted in the cause of good roads, reasonable motor car legislation and other legislation as the result of the courtesy shown by the associations.

Stratton to Sell Packards

ALBANY, N. Y., Jan. 23—E. V. Stratton, who has been the manager of the Philadelphia branch for Studebaker automobiles, has severed his connection with that company to accept a position as sales manager for J. A. P. Ketchum, representative of Packard automobiles at Albany.

Mr. Stratton has had a number of years' experience with the automobile industry, and prior to this was interested in the railroad business. He takes up his new duties on February 1.

New England Hotel Keepers Settling Down to Conservative Business

How to attract automobilists to good hotels when they are on touring bent is a problem which has confronted hotel men everywhere, and most of them have learned that automobilists as a whole are a conservative class, and they must be presented with conservative advertising by the hotel manager who desires to attain success. In the past hotels have suffered because they failed to appreciate the fact that not a few advertising schemes were catch-penny affairs which would do no great damage from the point of view of the mere cost of the advertising, but the bad impression they left with automobilists resulted in a falling off of business. The New England Hotel Association, which is composed of the hostleries of reputation in this most interesting touring section of the country, are taking steps in the direction of assuring automobile tourists that they will not be misled by promiscuous and ill-advised advertising matter, and they propose to confine announcements of accommodations to intelligently directed and truthful statements of fact. The last effort on the part of the association will best be told by publishing verbatim a letter from President Almon C. Judd, which was addressed to President H. M. Swetland, of the Automobile Blue Book Publishing Company, 231-241 West Thirty-ninth street, New York City:

"It gives me great pleasure to inform you and you are hereby authorized to state that the New England Hotel Association has officially endorsed the New England edition of the Automobile Blue Book for a period of five years and that we have agreed to confine our advertising for Automobile guide book purposes to your publication.

"We were led to take this action believing that it was for the best interests of the hotels that are represented by the 150 members of our organization, which means practically all of the leading hotels of New England—and also the interests of the motoring public who are our patrons.

"Your book is the acknowledged standard guide book; the road information having been carefully collected by experienced men covering the roads of New England in your cars, and, while revised and published yearly, there is no need for any similar publication—and there cannot be for a long time to come, and then only at a great expense to compile the same.

"If the touring motorist will but buy a Blue Book and start for New England he can easily find the way, and we assure him that he will find good roads, magnificent scenery and good hotels, whose proprietors will treat him fairly. New England hotels are famous the world over for excellent and fair dealing."

Black-Crow Drops the Black

Announcement is made by the Crow Motor Car Co., of Elkhart, Ind., that henceforth the word "Black" will be dropped from the name of the car manufactured by that company. Hereafter the line will be known as the "Crow."

Martin E. Crow has been re-elected president of the company and Otto F. Rost who for two years has handled the eastern and export business of the company will have charge of sales not only in the east but in New England and the export business as well.

Luce on Bay State Board

BOSTON, Jan. 23—Morton H. Luce, New England manager for the Velie Motor Vehicle Co. has just been appointed a member of the contest committee of the Bay State Automobile Association of Boston, by President E. A. Gilmore. Mr. Luce has accepted.

It is the intention of the directors and the contest committee to arrange a series of automobile contests and hill-climbs during this year. The members of the contest committee are: Harry W. Knights, Chester I. Campbell and Mr. Luce.

Top-Heavy Card at Los Angeles

LOS ANGELES, CAL., Jan. 23—Six races were decided on the one-mile board saucer yesterday. The program consisted of one-mile time trials in which the fastest time was made by a National (Wilcox) which covered the distance in 39 seconds.

There were three five-mile events, including a free-for-all, won by a National (Wilcox) in 3:21; a race limited to 600 cubic inches, which was won by a Knox (Nikrent) in 3:38 2-5 and a free-for-all handicap which was also won by a National (Wilcox) in 3:42 4-5.

The ten-mile free-for-all was captured by a Simplex in 6:54 and the 50-mile race limited to 600 inches was won by a National in 40:23 4-5.

United States Tire Co. Incorporated

Combining the sales departments of the Hartford Rubber Works Co., the M. and W. Co.; G. and J. Tire Co., and the Continental Caoutchouc Co., a new company, under the title of the United States Tire Co., capitalized at $500,000, has been incorporated.

The four companies have been allied as members of the Rubber Goods Manufacturing Co., a branch of the United States Rubber Co., and as far as the manufacturing end of the business is concerned they will retain their corporate existence as heretofore.

E. S. Williams has been chosen president of the new firm with C. J. Butler as vice-president. J. M. Gilbert, general manager of the Continental Caoutchouc Company, becomes general manager of the United States Tire Co., with J. D. Anderson as general sales manager.

According to official announcement the big company was formed to accomplish some economies in administration and to check competition among themselves. Other officers will be elected in the near future.

Baltimore Club After Law Breakers

BALTIMORE, Md., Jan. 23.—The Automobile Club of Maryland has furnished motorists of this city with cards, asking them to report on them any cases of speeding, reckless driving, etc., by chauffeurs, and return the information to the club.

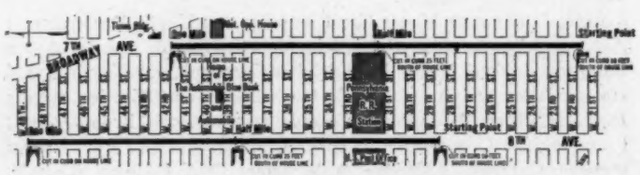
The club has decided on the following plan in coping with the reckless speeding craze: First offense the owner of the vehicle will be notified. Second offense the matter will be turned over to the proper authorities for prosecution, and third offense the proper authorities will make application to the Motor Vehicle Commissioner to have the registration of the car canceled.

Checking Your Odometer

Many automobile owners are anxious at times to know whether or not their odometers are registering distances accurately. It will be interesting for them to know that the Bureau of Taxicab Inspection has established two measured miles, one on Seventh avenue and one on Eighth avenue, as shown in the accompanying diagram which is reproduced from advance sheets of the Official Automobile Blue Book for 1911.

As will be noted in each case, the starting point at which the odometer should be set at 00.0 is indicated by a cut in the curb 50 feet south of the building line; on Seventh avenue, between Twenty-first and Twenty-second streets, and on Eighth avenue between Twenty-eighth and Twenty-ninth streets, the Seventh avenue mile ending at Forty-second street and the Eighth avenue mile at Forty-ninth street, each on the south building line.

A longer check would be from the south building line of Thirtieth street on Fifth avenue, ending at the north building line of 109th street, a distance of four miles.



Two measured miles for checking odometers

The Automobile's Foot-Wear

ILLUSTRATING THE EXTENT OF INFLUENCE OF THE TIRE TRADE UPON THE BUSINESS CENTER AND ACTIVITIES IN NEW YORK CITY

THOSE who visit the automobile shows once, or perhaps twice, a year, and limit their further activities in the matter of tires to the purchase of the re-equipment of their automobile to whatever extent the occasion requires, might not have time to study the situation broadly and learn of the great industry that is growing up under their residential nose. Since the best way to describe a thing is to show it, THE AUTOMOBILE instructed a battery of photographers to visit the haunts of tire-makers on Manhattan Island and bring back enough evidence to convince an interested reader that the tire industry is large and prosperous, and it occupies a niche of great prominence in the business world with splendid headquarters in the midst of the busiest section in New York City. Were the tire-makers to "fold their tents like the Arabs * * *," "Automobile Row" would look very much as if it were shot to pieces.

In the recount of the tire industry, not overlooking its ramifications, there seem to be 94 makers of tires in America; at all events, 94 concerns listed as engaged in the tire manufacturing industry, and since tires without rims would be impossible, there are 53 rim-makers whose support lends substance to the main idea. Apparently there are 35 makers of inner tubes, quite a number of whom are in addition to tire-makers and then there are 42 makers of jacks with an enormous business that must be directly traced to the use of pneumatic tires on automobile wheels. It might be too much to claim that the 40 kinds of shock absorbers to be had are companions to tire-makers, but the law of probabilities, which comes to our support whenever the situation looks vague, seems to indicate that shock absorbers do belong to the tire family because prior to the coming of the pneumatic tire there were no shock absorbers either made or used. The reason for this peculiar state of affairs is due to the fact that when pneumatic tires were made practicable the speed possible of attainment with vehicles was increased so enormously that a want for shock absorbers crept in, and in the final analysis of the automobile it will probably be said that tires have to do with the making of speed and shock absorbers are used to dampen the ardor of the body oscillations for the edification of those who ride in the tonneau.

Quite a Number of Inflated Ideas Pass Current

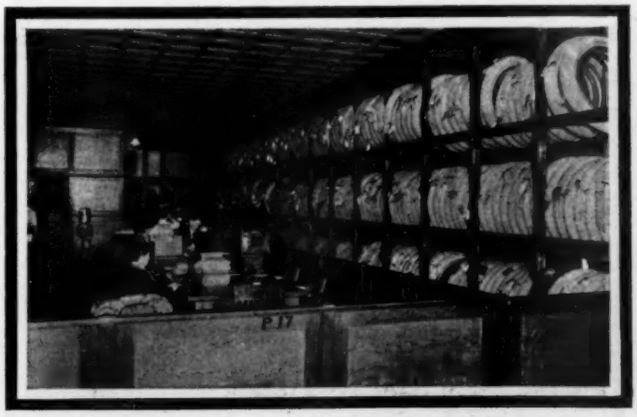
Were one to listen to the siren call of the thimble-rigger of Wall street and the seer of "Throgmorton" street as they madly attempt to attach wings to the heavier-than-air machine called the "rubber market," and hear them recite their little piece, including the statement of how the coming of the automobile enormously increased the demand for rubber, they having in mind tires, it would be essential to gather the impression that tires are made of rubber.

The automobilist who will examine the section of a pneumatic tire, referring to the casing, will find that it is composed of a number of layers of "frictioned fabric," in other words, layer upon layer of the fruit of the loom in the form of cotton, and each layer of cotton fabric has a coating of rubber applied to it, which operation is done on the cotton fabric prior to its use in the building of the tire. Quite a number of tires are made with five of these layers of frictioned fabric, and the exterior armor over the fabric is in the form of a layer of rubber composition over which is placed the tread.

The practice is not the same in all tire making plants, but, as a general proposition, the composition used in frictioning the fabric carries about 80 per cent. of rubber, but of the whole volume occupied by the friction fabric the textile material represents over 50 per cent. Referring now to the protecting layer outside of the textile material, it is a toughened composition carrying perhaps 60 per cent. of rubber, and the tread, which is designed for great toughness and the other properties required at the point of contact of the tire with the road, has less of rubber, so that when a casing is properly analyzed there is really not a large quantity of real rubber in it.

The quality of a tire resides in the quality of the frictioned fabric, and analyzing this product requires the serious consideration of the source of the cotton, the method of its selection, manipulation and weave, and it is more than likely that at least 90 per cent. of all the strength that resides in a tire must come with the cotton. To preserve the cotton from damage in service the frictioning process is resorted to, it being the case that the rubber compound as it is pressed into the interstices of the textile fabric separates the warp from the woof and the threads from each other, so that when the casing is flexed in service the give and take of the fabric will not induce friction and cutting of the cotton threads as they lie in their textile relation. In a sense, then, a popular conception of the use of the rubber as it relates to the cotton in the frictioned fabric is that of a lubricant and a binder.

But the rubber gum in the frictioned fabric has another important function to perform, since it is true that cotton de-



Interior of Morgan & Wright's Salesrooms on Broadway

Gibney Bros.' tire department at 54th St.

Diamond Tire Co. (exterior view)

teriorates when it is exposed to the weather and the vicissitudes of contact with the road, and the film of rubber compound over the textile material surrounding every thread serves as a seal for precisely the same reason that a doctor binds up a wound after it is properly cleaned and antiseptics are applied. It is not sufficiently well appreciated by those who purchase and use tires that the ferocious wolves of the microscopic world in the form of mildew and other fungus growths, attack and subsist on the fiber of the cotton.

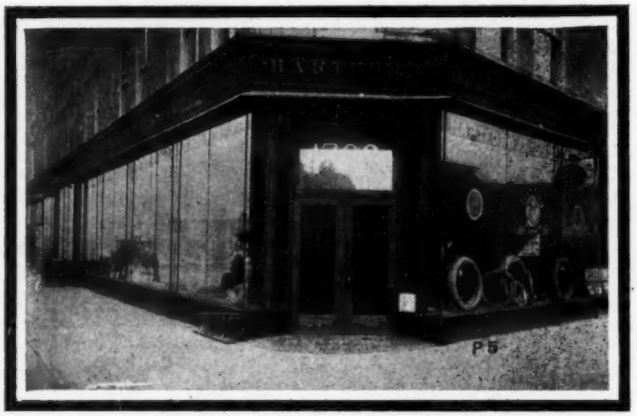
It is fortunate that these fungi abhor rubber, and to keep them from tickling their palates at the expense of the automobilist it is necessary to coat over each little strand of the cotton of the textile fabric with a dense skin of this most efficacious compound in order that the cotton will be adequately fortified from attack, thereby preserving its inherent strength so that it will continue to do the work for which there seems to be no substitute. The life of a tire in service depends primarily upon the quality of the textile fabric, and the amount of it that is utilized in view of the service which is expected of it, so that employing tires big enough for the cars in each case is an important consideration.

Goodyear Tire Co. showrooms

But no matter how well made a tire may be from the textile fabric point of view, and how much of the fabric is employed, considering the weight that must be sustained by the tire, life will be short at best unless the armoring effect of rubber is most perfect, because mildew and other fungi inhabit water on a basis of millions of the little rascals per square centimeter of area, and it may be that their ferocious appetites are accounted for by the large number of them which congregate and struggle for a meager existence in a single pearly drop of the purest liquid that flows from the bowels of Mother Earth.

By the time the water which is normally inhabited by countless numbers of fungi is spilled upon the roadbed and saturated by countless cousins and uncles and aunts of the mildew family, the situation becomes so formidable that the life of a tire once it is bared of its antiseptic coat is far too short to encourage investment. It is a great misfortune perhaps that cotton fabric is a most efficient wick, but in the days when kerosene oil was used for lighting purposes to the exclusion of more modern facilities it was deemed fitting that cotton should be used for wicks and those who depended upon this means of illumination would have been in a sad predicament were it not for the fact that water will traverse the length of a cotton fabric if one end of it is dipped in the liquid. In order to prove that mildew and kindred fungi live in water, if it is considered too simple to look at these growths through a microscope, it is only necessary to place a cotton wick with one end of it submerged in water and let it stay there for a few days. At the expiration of this time the wick will be so glutted with fungus growths that no more water will be permitted to pass through the interstices of its length; in other words it will be so littered with fungus growths that there will be no room for any other material.

Transferring this idea to tires, it remains to be said that if the textile fabric is bared at a point the cotton will serve as a wick and it will pick up water from the roadbed, whence this



Hartford Co.'s salesrooms on 58th St. and Broadway

liquid will travel throughout the length of the fiber, carrying with it myriads of mildew, and they will multiply and prosper. Not so the tire. The layman will say that the fabric has rotted out; in all truth these mildew families attack the cotton with vivacity, and the more they take on of avoirdupois the greater is the pressure upon the purse-strings of the owner of the tires.

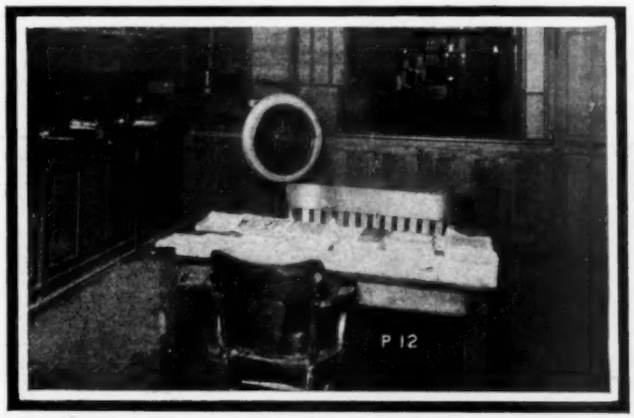
The remedy lies first in the use of a high grade of textile fabric for purposes of strength in the tires, and the protection of this fabric by means of the frictioning process, through the good office of which a dense elastic skin is given to each little thread of the textile makeup, and through pressure as applied in the making process, the threads are elastically adhered to each other, thus making a homogeneous casing capable of sus-

G & J Tire Co. salesrooms (exterior view)

taining under the most severe conditions of automobile service, afforded absolute protection from the attack of mildew for the life of the rubber so long as it is not abraded, thus exposing to attack some part of it, and the further ramifications of this fell disorder, brought to its most appalling state through the phenomenon akin to the action of a wick.

Newark Club Gives Its Banquet

NEWARK, Jan. 24—About 300 members and guests of the New Jersey Automobile and Motor Club attended the eighth annual banquet of the organization in the New Auditorium last night No reference to the recent split with the Automobile Club of New Jersey was made by any of the speakers, nor to the consequences of it as they affected the local club's status in the eyes of the A. A. A. A telegram was read from Henry Sanderson, president of the Automobile Club of America, conveying his good wishes to the diners and expressing regret at his inability to attend.

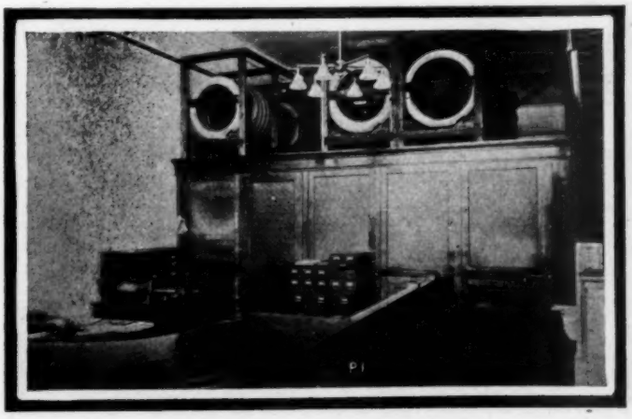


Order department of the Michelin Tire Co. on Broadway

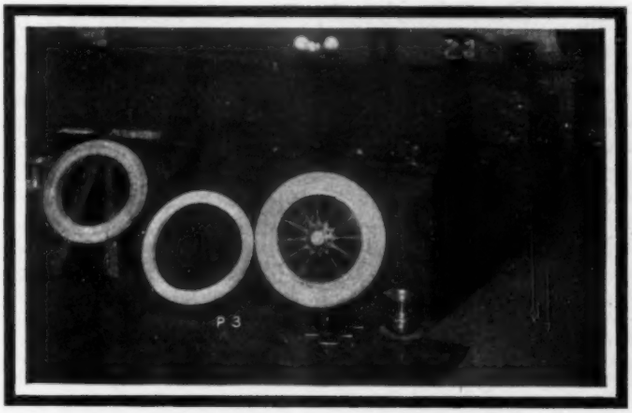
Duryea Points Out Defect in Law

Charles E. Duryea, in a letter to THE AUTOMOBILE makes the following comment upon a defect in the New York automobile law: "Your report of the new Washington, D. C. light law (p. 101, Jan. 5), shows that it contains a very sensible provision, in that it allows a vehicle delayed by accident an hour and a half to get to its stable if proceeding not faster than a walk.

"This sensible provision was a part of a New York law at one time, but when the bicycle and auto came, this emergency clause was dropped out. Nobody seemed to care how much these new conveyances might be inconvenienced at times by having no lights and since their users were in the minority and could not force decent treatment, the proper thing has seemed



Interior of Ajax showrooms



Interior of the Fisk showrooms on Broadway

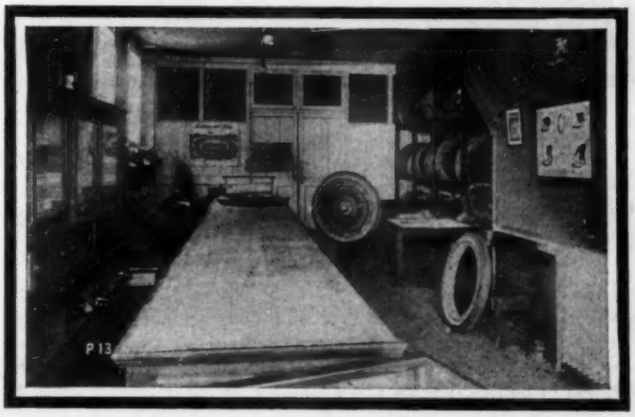
to be "soak 'em." Provision should be made in every case that a man may proceed at some pace when by chance he is caught by darkness without his lights."

Detroit Planning Convention Hall

DETROIT, Jan. 23—Plans are already under consideration for a municipal convention and exposition hall, as a result of the manner in which the utter inadequacy of present facilities was brought home by the two automobile shows last week. The common council, Board of Commerce, Detroit Automobile Dealers' Association, United Automobile Dealers' and Manufacturers' Association, local automobile makers and other interests are back of the agitation.

$250,000 a Year for Good Roads

LANSING, MICH., Jan. 23—State Highway Commissioner T. A. Ely will ask the Legislature for an appropriation of $250,000



Interior of Continental Tire Co.'s salesrooms

annually for the ensuing two years to conduct the highway department and provide for state rewards on good roads.

The last appropriation was for $150,000 annually and the work of the department consumed the entire amount and the balance of $57,000 in the treasury when Commissioner Ely was appointed.

About 300 miles of state reward road were built the last fiscal year and already applications are on file for 250 miles.

Newark, N. Y., Club Officers

NEWARK, N. Y., Jan. 23.—The list of officers elected to serve the Newark Automobile Club during the year are as follows: President, Charles T. Bloomer; vice-president, Henry B. Rogers; secretary, W. P. Rupert, and treasurer, C. P. H. Vary.

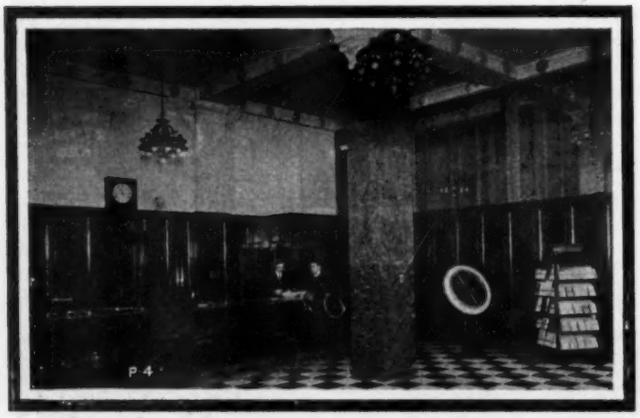
Detroit Shows Big Successes

DETROIT, MICH., Jan. 23—Detroit's two automobile shows—the fourth annual exhibit of the Detroit Automobile Dealers' Association and the first annual display of the United Automobile Manufacturers' and Dealers' Association—closed Saturday night, after one of the most memorable weeks in the history of the local motor industry. The promoters of both enterprises express themselves as well pleased with the results, immediate and prospective, for some of them promise to be very far-reaching.

Viewed from any angle, the shows, or the show, if the United display is to be considered in the light of an "overflow," was a pronounced success. The total attendance was about 125,000.

St. Louis Space at Premium

ST. LOUIS, Jan. 23—Premiums are being offered for show space in St. Louis, according to the committee in charge. The space has been all taken for some time, and it is reported on excellent authority that several of the larger concerns, which at first were not in favor of a 1911 exhibit, have made substantial offers for space allotted. No transfers have been reported, however. Work on the mechanical part of the decorations already has begun. The immense green carpet which will cover the entire floor of the Coliseum has been completed, and the 9-foot pillars which will be surmounted by electric lights are in course of construction.



Interior of Goodrich sales department

Auto Show at Newark, O.

NEWARK, O., Jan. 23—The Licking Motor Car Company, of Newark, O., announces that it will hold an automobile show February 16 to 19 at its salesrooms on South Fourth street. The display will consist of Maxwells, Columbias, Owens, Reos, Inter-States, Franklins, Regals and a number of other lines.

Blaze of Lights at Buffalo Show

BUFFALO, N. Y., Jan. 23—The ninth annual automobile show, which will be held in this city in the Broadway Arsenal, from February 6 to 11 inclusive, under the auspices of the Buffalo Automobile Trade Association, promises to be most successful.

A great deal of money has been put into the decoration of the building and 5,000 electric lights have been installed in order that the displays may be seen to the best advantage.

Altenberg Goes to Zimmerman Company

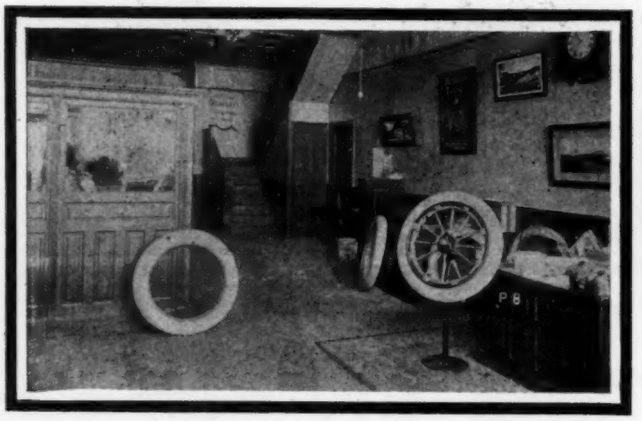
CHICAGO, Jan. 23—E. C. Altenberg has been appointed Sales and Advertising Manager of the Zimmerman Mfg. Co., Auburn, Ind., and has entered upon the duties pertaining thereto.

Firestone tire showrooms

Hoosiers to Show Individually

INDIANAPOLIS, Jan. 23—The annual automobile show, or opening of local dealers and manufacturers, will be held February 27 to March 4, inclusive. Some 200 automobile tradesmen are working on the plans and something better than usual may be expected. Each dealer and manufacturer will exhibit in his own place of business, which will be attractively decorated and there will also be special attractions to draw visitors from outside of the city.

One of the principal features of the week will be a Mardi Gras parade, which will include a number of automobiles decorated with flowers. There will also be races and exhibitions of skilful driving. The opening will be under the auspices of the Indian-



Interior of Republic Rubber Co.

Exterior of Batavia showrooms

Exterior of the Stein Laplock

apolis Automobile Trade Association, of which F. I. Willis, of the Hearsey-Willis Company, is president.

Promotion for Grand Rapids Man

TOLEDO, O., Jan. 23.—G. P. Dowling has been appointed manager of the Toledo branch of the Buick Motor Company, taking

Empire tire salesrooms

the place formerly held by F. S. Rockwell. Mr. Dowling has for two years been manager of the Grand Rapids branch of the company. The Toledo territory covers twenty counties of Northwestern Ohio, and has jurisdiction over twenty-five subagencies. In order to get in better touch with his workers, Dowling chartered a car to Detroit, entertaining all his salesmen at the combination Detroit automobile shows last Thursday and had a good time.

Prince Tire Co. salesrooms on Broadway

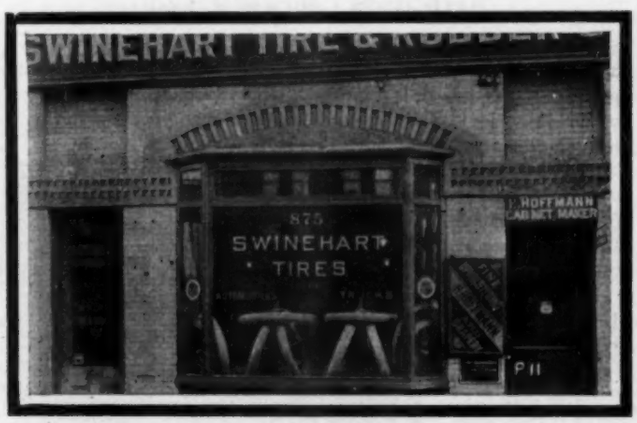
Petrel Company in New Plant

MILWAUKEE, Jan. 23—A new era is marked in the affairs of the Petrel Motor Car Company, of Milwaukee, Wis., manufacturer of the Petrel friction drive cars, by the removal of the plant to its new buildings at the southern border of Milwaukee. The company is now owned by the Filer & Stowell Company, which concern also owns the Beaver Manufacturing Company, maker of the Beaver gasoline motor for cars and trucks. Seven models are now being issued, ranging from 22 to 35 horsepower. The Petrel company held a private show during the Milwaukee exposition, January 14 to 20.

Busy Again at Parry Plant

INDIANAPOLIS, Jan. 23—Operations have been resumed in the plant formerly operated by the Parry Automobile Company, now the property of the Motor Car Manufacturing Company. The new company proposes to employ from 500 to 600 men and turn out about 1,000 cars this year.

William C. Teasdale, Jr., formerly vice-president of the Parry company, is president of the new concern; G. O. Simons is vice-president and general superintendent, and Wayne K. Bromley is secretary and treasurer; F. C. Dorn and F. H. Yeagle are the other directors. Some of the largest creditors of the Parry com-



Swinehart Tire Co. salesrooms at 7th Ave.

pany, which was sold at receivers' sale some weeks ago, are interested in the new company.

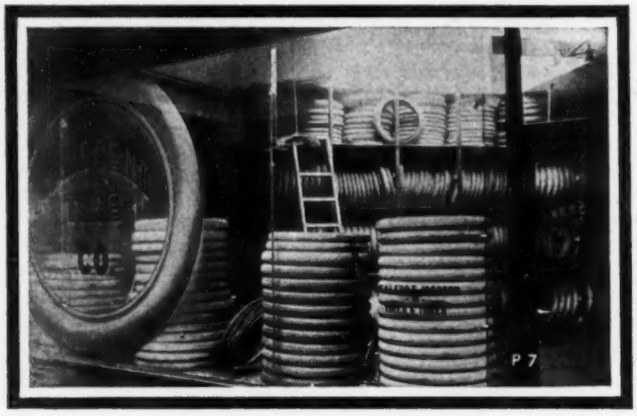
Lozier Ready to Go to Detroit

Announcement is made that the headquarters of the Lozier Motor Company will be removed from New York to its new building in Detroit by March 15. The building at Fifty-sixth street and Broadway will be utilized as headquarters of the New York branch and a service department. The recently purchased property on Thompson avenue, Long Island, will be used as a service building after the current season.

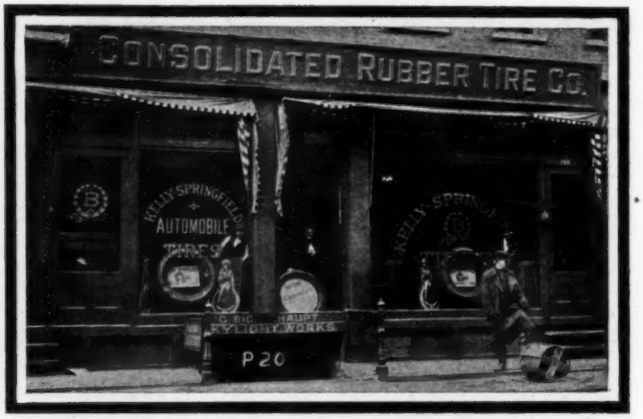
Cavac Car Makes Its Bow

Among the new cars now being placed on the market is the Cavac, manufactured by the Small Motor Car Company of Detroit. This car is a roadster equipped with a four-cylinder, four-cycle motor developing 24-horsepower. The cylinders are cast in pairs and are of the valve-in-the-head type. Ignition is by magneto and dry cells. A rotary pump and large radiator attend to the cooling and the carbureter is of the float feed class. A circulating system of lubrication, augmented by force feed from gear driven pump provides for thorough and economic oiling.

The clutch is of multiple discs running in oil. The transmission is three-speed selective and drive is positive. The wheel-



Crescent Tire Co. showrooms



Exterior view of the Kelly-Springfield salesrooms

base is 100 inches and tire equipment 34 by 3 1-2 inches. An underslung frame giving a road clearance of 10 1-2 inches places the center of gravity at a low point. The car with full equipment of lamps, tools, horn, etc., and guaranteed on broad lines for one year, sells for $1,050 F. O. B. Detroit.

Arthur N. Jervis Dead

Arthur N. Jervis, advertising manager of the automobile department of the American Locomotive Company died at his apartments in the Hotel Carlton, Monday morning of pneumonia. Mr. Jervis was one of the pioneer motor writers of New York, having been associated with the New York *Sun* when that publication installed an automobile department. He left the *Sun* to go with the Alco.

As a descriptive writer he displayed ability of a high character and his feature articles will long be rated with the motor classics.

Mr. Jervis was stricken with the fatal disease early in January, but remained at his work until a few days before his death.

The Late Arthur N. Jervis

Premier Opens Salesrooms

INDIANAPOLIS, Jan. 23—Sales headquarters have been opened in this city by the Premier Sales Company at 312 North Delaware street. The Premier factory will be represented in the new concern and it is probable that next week will see the removal of the executive, sales and advertising departments of the manufacturing company to the new location. President Harold O. Smith will have his office in connection with the branch and will take the majority of the factory selling business to the store, which is much more central in relation to city business places than is the factory plant in the east end of town.

The salesroom has been finished in green and white, with a touch of red in the mahogany furniture, and is large enough to display five or six cars with ease. At the rear of the hall there are offices for the local salesmen and factory department heads, and a rest and writing room for ladies. Still further to the rear are spaces for the clerical force, storage space for cars and a private garage.

K-R-I-T Company Changes

DETROIT, MICH., Jan. 23—Among the important developments of the last week was the taking over of the Krit Motor Car Company, maker of the K-R-I-T car, by a syndicate of Detroit capitalists, headed by Walter Russel, of the Russel Wheel & Foundry Co. The syndicate takes enough of the stock at par to secure a controlling interest. A complete reorganization has taken place and the company, on Feb. 1, will move from its present factory at Leib and Wight streets to the more commodious plant recently vacated by the Owen Motor Car Co. at Mt. Elliott avenue and East Grand boulevard.

W. S. Piggins is succeeded as president by Lawrence Moore, who will also be general manager, giving up his position as sales manager for the Russel Motor Axle Co. Kenneth Crittenden, designer of the K-R-I-T car, remains as vice-president and will also continue in charge of the engineering department. Edward Crosby Doughty is secretary and treasurer, succeeding F. W. Kanter and B. C. Laughlin. Walter Russel is chairman of the new board of directors. The company is capitalized at $250,000.

Montreal Motor News Notes

MONTREAL, Jan. 23—The City Council of Quebec City has under consideration a proposition to levy a tax of $25 per annum upon every automobile. Final action in the matter has been delayed on account of uncertainty as to any possible conflict with the Provincial authorities in the matter on the subject of jurisdiction.

The latest auto salesrooms to be opened in Montreal are at 626 St. Catherine West, and the name of the company is the Hill Motor Company of Canada, Limited, which has started business as Canadian agent for the Moon and Krit cars.

The Wilson Automobile Company, Limited, has opened showrooms at 920 St. Catherine West, where it is handling the Locomobile, Mitchell and Overland cars.

A. Jennings & Company, who are local representatives for the Grabowsky commercial cars, have been appointed distributors for the Beyster Detroit cars.

The Grand Trunk Railway has received during the past week delivery of upward of a hundred automobile freight cars, the last consignment of an order for 500 placed with the American Car & Foundry Company nine months ago. They are on the improved lines suggested by the N. A. A. M.'s Traffic Department.

Greatest Chicago Show Comes Next

CHICAGO, Jan. 23—With such an array of pleasure cars, freight vehicles and accessories as never before have graced an automobile show in the Windy City the Tenth Annual National Automobile Show, under the auspices of the N. A. A. M., opens Saturday night for a run of two weeks.

Magnificent decorations will be used to set off the mechanical perfection of the cars and every detail of preparation has been attended to with painstaking care.

It is confidently predicted by the management that the Chicago show this year will break all records, just as all the shows held heretofore this season have set new marks for their localities.

Arrangements have been made to accommodate vastly larger crowds than ever before attended an automobile exhibition in Chicago and the interest already apparent in advance reservations at hotels indicates that the promise of a big out-of-town crowd is well founded.

A special effort has been made to attract city officials from various places in the Middle West, and as a result of the campaign something over 150 officials have signified their intention of attending the big show. They live as far south as Tennessee and are scattered from the Pennsylvania line on the East to Nebraska on the West. They are interested not only in trucks for service in various municipal departments such as fire, police and hospitals, but also in the passenger cars suitable for the heads of water, health, engineering and executive departments.

Federal officials, particularly those in the postal service, will be present in considerable numbers to inspect the machines suitable for mail carrying and delivery.

Besides the line of pleasure cars, which will be very complete, the truck exhibit, convertible cars, electrics and accessories will be far in advance of anything ever shown in Chicago. Delivery wagons of light construction and capacity of about 1,000 pounds will be a feature. Taxicabs of several types will attract liverymen and taxicab companies, while "rubberneck" wagons of several styles will be shown.

The list of accessories to be displayed is peculiarly complete and typical of the advance scored by the industry. Included in this list are the following companies—a total of 187 concerns:

List of Accessories Exhibitors at the National Show at Chicago

COLISEUM GALLERY

Space	Name
1	Michelin Tire Co.
2	Lovell-McConnell Mfg. Co.
3	Vesta Accumulator Co.
4	Standard Roller Bearing Co.
5a	Hayes Mfg. Co.
5	Herz & Co.
5b	Imperial Brass Mfg. Co.
6	C. T. Ham Mfg. Co.
7	The Jones Speedometer Co.
8	N. Y. & N. J. Lubricant Co. C. A. Mezger
9	Weed Chain Tire Grip Co.
10	Continental Caoutchouc Co.
11	Valentine & Co.
12	Wheeler & Schebler
13	Conn. Telephone & Electric Co.
14	Swinehart Tire & Rubber Co.
15	A. O. Smith Co.
16	Consolidated Rubber Tire Co.
17	Heinze Electric Co.
18	Pennsylvania Rubber Co.
19	Warner Instrument Co.
20	Republic Rubber Co.
21	Republic Rubber Co.
22	McCord Mfg. Co.
23	Whitney Mfg. Co.
24	Briscoe Mfg. Co.
25	Joseph Dixon Crucible Co.
26	Morgan & Wright
27	Morgan & Wright
28	Standard Welding Co.
29	American Ball Bearing Co.
30	Hartford Rubber Works Co.
31	Hartford Rubber Works Co.
32	Timken-Detroit Axle Co.
33	Timken Roller Bearing Co.
34	R. E. Dietz Co.
35	Diamond Chain & Mfg. Co.
36	Gray-Hawley Mfg. Co.
37	Wm. Cramp & Sons Ship & Eng. Bldg. Co.
38	Fisk Rubber Co.
39	Fisk Rubber Co.
40	National Tube Co.
41	Badger Brass Mfg. Co.
42	Veeder Mfg. Co.
43	Gray & Davis
44	G & J Tire Co.
45	G & J Tire Co.
46	National Carbon Co.
47	B. F. Goodrich Co.
48	B. F. Goodrich Co.
49	C. F. Splitdorf
50	Gabriel Horn Mfg. Co.
51	Godyear Tire & Rubber Co.
52	Goodyear Tire & Rubber Co.
53	Long Mfg. Co.
54	J. H. Williams & Co.
55	Diamond Rubber Co.
56	Diamond Rubber Co.
57	Warner Gear Co.
58	A. W. Harris Oil Co.
59	Hartford Suspension Co.
60	Hartford Suspension Co.
61	Baldwin Chain & Mfg. Co.
62	Spicer Mfg. Co.
63	Brown-Lipe Gear Co.
64	Pittsfield Spark Coil Co.
65	Continental Motor Mfg. Co.
66	Remy Electric Co.
67	Firestone Tire & Rubber Co.
68	Firestone Tire & Rubber Co.
69	The Electric Storage Battery Co.
70	Oliver Mfg. Co.
71	S. F. Bowser & Co.
72	S. F. Bowser & Co.
73	Edmunds & Jones Mfg. Co.
74	Kokomo Electric Co.
75	Byrne-Kingston & Co.
76a	U. S. Light & Heating Co.
76	C. F. Ernst's Sons

COLISEUM ANNEX (SECOND FLOOR)

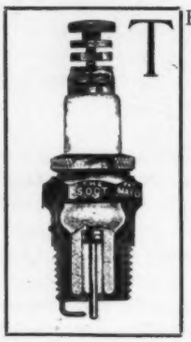
Space	Name
77	Motz Clincher Tire & Rubber Co.
78	Warner Mfg. Co.
79	Sprague Umbrella Co.
80	Sprague Umbrella Co.
81	Auto Parts Mfg. Co.
82	Royal Equipment Co.
83	Royal Equipment Co.
84	Muncie Gear Works
85	Gemmer Mfg. Co.
86	Excelsior Motor & Mfg. Co.
87	Stromberg Motor Devices Co.
88	Stromberg Motor Devices Co.
89	Havoline Oil Co.
90	Sherwin-Williams Co.
91	Thermoid Rubber Co.
92	Thermoid Rubber Co.
93	Cook's Standard Tool Co.
94	Booth Demountable Rim Co.
95	Auto Improvement Co.
96	American Ever Ready Co.
97	The Homo Co. of America
98	Ross Gear & Tool Co.
99	Whiteley Steel Co.
100	Turner Brass Works
101	Edison Storage Battery Co.
102	Driggs-Seabury Ordnance Corp.
103	National Coil Co.
104	Link-Belt Co.
105	Stewart & Clark Mfg. Co.
106	Cleveland Speed Indicator Co.
107	Empire Tire Co.
108	Empire Tire Co.
109	Western Motor Co.
110	Eisemann Magneto Co.
111	Eisemann Magneto Co.
112	Sparks Withington Co.
113	Stein Double Cushion Tire Co.
114	Randall-Faichney Co.
115	Continental Rubber Works Co.
116	Briggs Mfg. Co.
117	Star Rubber Co.
118	Bosch Magneto Co.
119	Porch Magneto Co.
120	E. B. Van Wagner Mfg. Co.
121	Motsinger Device Mfg. Co.
122	R. E. Hardy Co.
123	Voorhees Rubber Co.
124	Pantasote Co.
125	Ajax-Grieb Rubber Co.
126	Ajax-Grieb Rubber Co.
127	Gilbert Mfg. Co.
128	J. H. Sager Co.
129	Globe Mach. & Stamping Co.
130	Adam Cook's Sons
131	Never-Miss Mfg. Co.
132	Leather Tire Goods Co.
133	Briggs & Stratton Co.
134	Atwater-Kent Mfg. Works
136	C. A. Shaler Co.
137	Batavia Rubber Co.
138	George A. Haws
139	Dover Stamping & Mfg. Co.
140	McCue Company
141	Pfanstiehl Electrical Laboratory
142	Apple Electric Co.
143	Reichenbach Laboratories Co.
144	Willard Storage Battery Co.
145	Auburn Auto Pump Co.
146	Standard Thermometer Co.
147	Russel Motor Axle Co.

FIRST REGIMENT ARMORY (BALCONY)

Space	Name
1	Horseless Age
2	Elite Mfg. Co.
3	Ajax Trunk & Sample Case Co.
4	Wm. E. Pratt Mfg. Co.
5	Norton Company
6	Perfection Spring Co.
7	Atlas Chain Co.
8	Adams & Westlake Co.
9	Universal Tire Protector Co.
10	Fellwock Auto & Mfg. Co.
11	Lutz-Lockwood Mfg. Co.
12	Motor Parts Co.
13	Charles O. Tingley & Co.
14	Barco Brass & Joint Co.
15	Motor Vehicle Publishing Co.
16	Findelsen & Kropf Mfg. Co.
17	Atlantic Refining Co.
18	F. A. Brownell Motor Co.
19	Skinner & Skinner Co.
20	Marshalltown Buggy Co.
21	Simms Magneto Co.
22 S½	K. & W. Mfg. Co.
22 N½	Armiger Chemical Co.
23	Garage Equipment Mfg. Co.
24	Haystrom Bros. Mfg. Co.
25	K-W Ignition Co.
26	Gates-Osborne Mfg. Co.
27	Frank E. Sparks
28	Standard Varnish Works
29	Shawmut Tire Co.
30	Keystone Lubricating Co.
31	John W. Blackledge Mfg. Co.
32	Polson Mfg. Co.
33	Union Auto Repair Co.
34	Cycle & Auto Trade Journal
35	Motor Age
36	Morrison-Ricker Mfg. Co.
37	Troy Carriage Sunshade Co.
38	Model Gas Engine Works
39	Lonodin-Brugger Co.
40	Automobile

Spark Plugs

EXPLAINING THE DIFFERENT FEATURES AND CHARACTERISTICS, METHODS OF INSULATION, AND MEANS OF CLEANING AND REPAIRING MANY OF THE WELL-KNOWN TYPES NOW IN USE



THE best position of the spark plug in the cylinder has been a debatable point, and in some motors with the plug placed over the exhaust valve the power has been increased several horsepower, while when the plug was placed in a similar position on a motor that usually had the plug over the intake valve the power decreased and the plug fouled so soon that it had to be removed, cleaned and reinstated in the original position.

Apart from the position of the plug the question of the plug itself and its qualities is of importance to the average motorist. In the accompanying illustrations different spark plugs on the market are depicted:

Herz—This plug is somewhat unusual in shape, and from the sectional view it will be seen that the conical steatite insulator is inserted from below and the joint made between it and the metal by screwing up the nut above. This plug is marketed by Herz & Co., 295 Lafayette street, New York.

Mosler—The plugs are of the porcelain type and the method of bridging the gap is shown. They are made by A. R. Mosler & Co., who also make the Spit-Fire. In this latter the base is made in the form of a cap with a hole drilled in the center and slots cut on either side.

Hagstrom—A feature of the Hagstrom plug is the porcelain guard placed at the base and held in position by a metal sleeve. The expansion due to heat is taken care of by inserting a copper and asbestos washer between the boss of the porcelain and the point of contact on the base. This plug is manufactured by Hagstrom Bros. Mfg. Co., 145 West 49th street, New York.

Bosch—This plug is intended for use with high-tension magneto and has steatite insulation, the center core can be removed for cleaning. It is claimed by the makers that this plug is well adapted to motors that suffer from overlubrication.

Albright—This type of plug has a mica insulation and the feature of the sparking points can be seen if reference is made to the illustration. The end of the center core is shaped in the form of a star. It is manufactured by the Albright Ignition Co., Columbus, Ga.

Splitdorf—This plug belongs to the mica variety designed for use in connection with high-tension magneto. The outside shell of the insulation is made of special porcelain, inside which there is a white india mica insulation. This plug is manufactured by C. F. Splitdorf, of 138th street, New York.

Wico—This plug has a porcelain insulation and is of the standard type, as shown in section; a double locking arrangement may be fitted, however, locking the boss of the insulator in an adjustable grip.

Circle Fire—This plug is of the closed end type with double mica insulation. The core bolt is formed with a head at its lower end that will just pass through the shell, forming a circular spark gap.

Monarch—These plugs are simple in construction and are designed so that they can be taken apart easily in case repair or cleaning is necessary. In this type the base is formed of steel and the electrode securely attached to the base; they are manufactured by Benford Mfg. Co., Mt. Vernon, N. Y.

Vulcan—These plugs as well as the Gotham are the product of the R. E. Hardy Co., 1735 Michigan avenue, Chicago. The principle of their construction can be seen in the cut.

Reliance—The insulated sparking point is a hair-like platinum wire protected from corrosion by being baked in and brought flush with the surface of the porcelain insulator. Contact with the platinum wire is made by means of a copper quill and spring, the latter compensating for any difference in expansion and contraction between the porcelain and the quill. This plug is the product of Jeffry-Dewitt Co., Detroit, Mich.

J. D. Petticoat—This plug is manufactured by the same company as the Reliance, and its construction is clearly shown in the accompanying illustration.

All in One—This plug is designed for a dual purpose to serve as a compression cock as well as a plug. It is possible by turning the tap to insert in the cup enough gasoline to clean the plug or facilitate starting. These are manufactured by the Buffalo Carbureter Co., Detroit.

Best—This plug belongs to the porcelain variety with the central electrode terminating upon a button head and surrounded by a ring terminal formed by the body of the plug, presenting countless number of sparking points. This plug is manufactured by Best Ignition Equipment Co., 200 West 64th street, New York.

Champion—This plug has a porcelain insulator through which a stout electrode passes ending in a wire point as shown; the bar passes across this and can be adjusted to the required amount easily.

The Point—As seen in the illustration, this plug has a dome head in which the electrode with a pronged end is situated. The gases pass through the small holes. Manufactured by Spark Plug Co., Aberdeen, S. Dak.

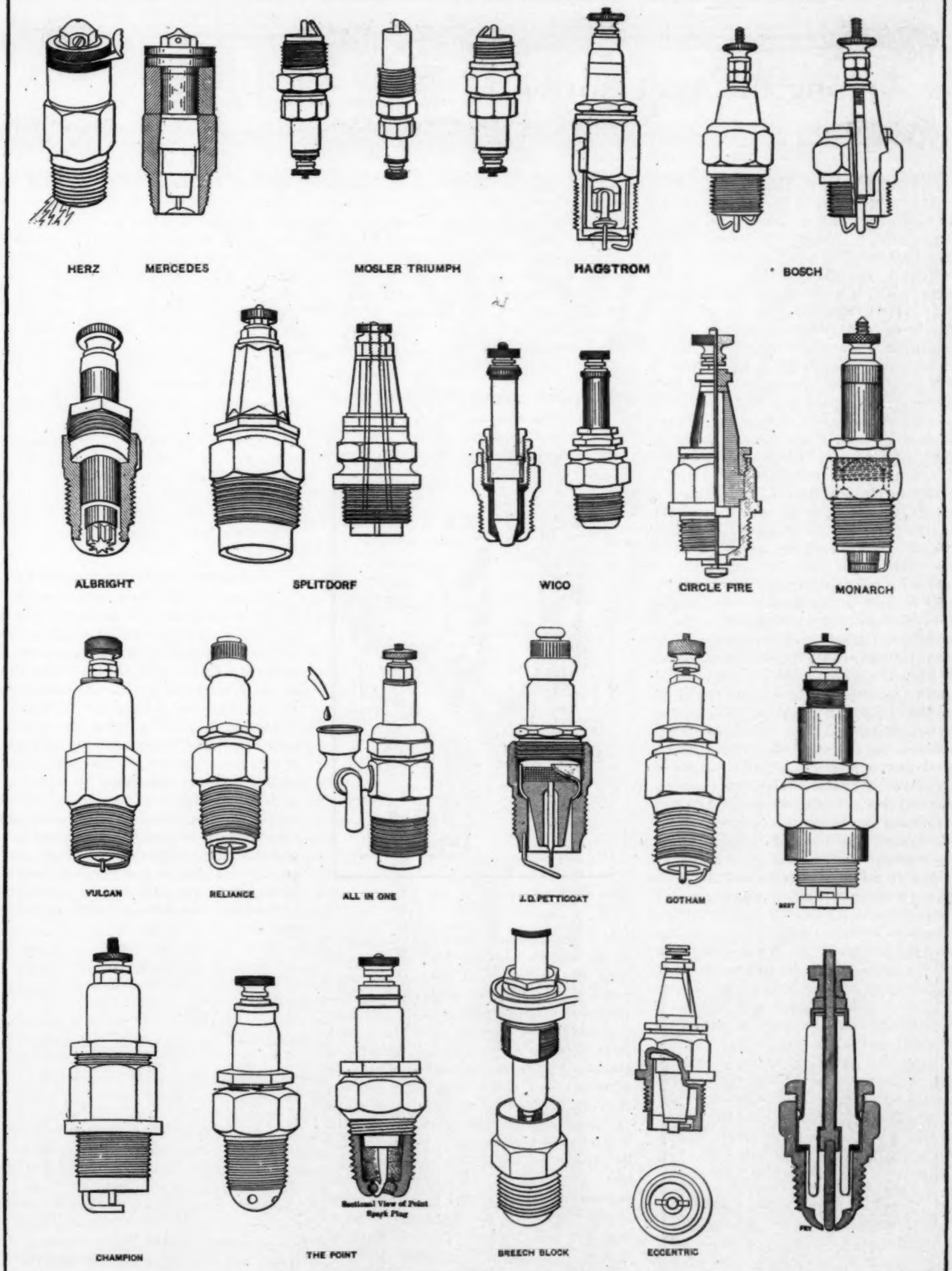
Breech Block—The breech is fitted with a triple thread which permits placing the handle in any position. By simply turning the lever the plug body can be freed from the porcelain and cleaned. This plug has a protected end in the form of a dome with a slot.

Eccentric—The feature of this plug lies in the fact that the sparking points can be adjusted by simply giving the core a part of a turn. It will be seen that the shell is bored eccentrically. There is but one spark point, which is securely attached to the end of the core and projecting at right angles to it. The indicator slot on the insulator acts as a guide and the sides of the plug are marked M and BM for magneto and B for battery.

Fry—This plug, as seen in the illustration, is very simple and can be removed for cleaning operations by loosening the packing holder ring. The cap-shaped dome protects the porcelain from the excessive heating effect of the flame, which is apt to penetrate through a poor porcelain. The distributor for these plugs is H. M. Cormack & Co., 1876 Broadway, New York.

Soot-Proof Mezger—As seen in section, the soot-proof plug has an extension to the porcelain, and the soot has to form up one side and clear down the other to make a bank of soot connecting the electrode. As the gap at the points is only 1-32 inch the current is more likely to jump this than through the soot formation, which offers more resistance than the air between the gap. These plugs are marketed by the United Manufacturers, 250 West 54th street, New York.

Red Head—These plugs have a porcelain core with a stout electrode passing well down into the valve pocket. Around this the porcelain forms a cylindrical insulation to prevent the deposits that are liable to form inside the plug from bridging between the core and the metal base. They are made by Emil Grossman, New York.



SOME OF THE WELL-KNOWN MAKES OF SPARK PLUGS NOW ON THE MARKET

Among the Accessories

THE LEECE-NEVILLE TYPE OF ELECTRIC LIGHTING SWITCHES; FEATURES OF THE EXCELSIOR CARBURETER; THE NEW LAVIGNE STEERING GEAR

LAVIGNE'S NEW STEERING GEAR

Referring to Fig. 1 of a section of the new Lavigne steering gear, it will be observed that it belongs to the double leverage, push-and-pull type. In describing this new gear, the Lavigne Mfg. Co., of Detroit, Mich., is authority for the statement that there is absolutely no lost motion at the wheel, and as the construction shows, any wear which might induce lost motion is taken up automatically. The wear is a remote contingency due to the very large surfaces of pressure, and to the ease with which metal-to-metal contact is obviated at these pressure zones through the facilities afforded for lubrication purposes. While it is not considered desirable to resort to the principle of irreversibility in steering gears, it is an advantage in this design to be able to fix upon any desired degree of irreversibility as indicated by the performance of the automobile on which the steering gear may be placed. The gear is made in five sizes for cars ranging between 1,500 and 5,000 pounds. The illustration shows two operating slides threaded right and left, and in these slides, as shown by dotted lines, a slot is provided which accommodates two square blocks encircling a pair of trunnions. These trunnions are integral with the rocker which operates the steering lever. The principle of construction embodied in this design affords an enormous leverage if the occasion requires and it is this advantage which permits of increasing the irreversibility of the gear. The wearing contact of the screw thread shaft figures out 6 1-4 square inches of actual surface in contact at the pressure zones. Wear is taken up automatically by a pair of gibb shoes. The case is of malleable iron and made grease-tight; the sliding blocks are of bronze, and the trunnion blocks are of steel, finished to accuracy, and subsequently hardened, after which they are ground. The rocker shaft is a drop-forging utilizing a suitable grade of steel, and it is also hardened and subsequently ground to size. The shape of the gear lends facility to its application.

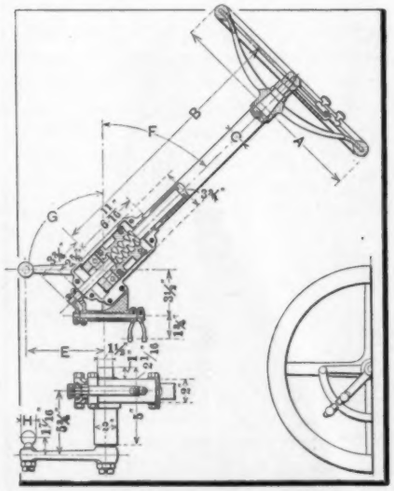


Fig. 1—The Lavigne steering gear

EXCELSIOR CARBURETER A NEW ONE

The carbureter as depicted in Fig. 2 shows a section of the new Excelsior concentric float-feed type of carbureter, in which the gasoline enters at the bottom in the middle and the float is concentric with the extension of the casting as it reaches down from the primary intake with the floatbowl being held in place by clamping around the central core and a butt-joint which is finished to the diameter of the shell. The nozzle through which the gasoline flows to the depression chamber is at the dip point in the primary air transfer port, and a needle screws down with a tapered end by means of which the flow of gasoline is regulated to suit the requirement of the motor. The primary air enters at a point above the floatbowl, passes through a siphon-like passageway down to the region of the nozzle, thence up to the mixing chamber above, the latter being the enclosure in juxtaposition to the auxiliary air valve below the cutting-off point of the damper-like throttle. An adjustment is provided for the auxiliary air valve, thus regulating the flow of the same to suit the requirement as indicated by the suction of the motor, and the gas as it passes out and away to the motor is obstructed by the adjustment of the throttle valve, the latter being by hand excepting that the throttle-stop screw is initially adjusted so that the amount of mixture which will bleed by when the motor is being started will suffice for the purpose, and the richness of the mixture will be regulated by the extent of the obstruction afforded by the throttle valve, indicated by the displacement of the piston of the motor. The carbureter is compact, of symmetrical design, and among its new features is the ball in the passageway at a constricted point, cutting off the region around the nozzle from the mixture chamber proper.

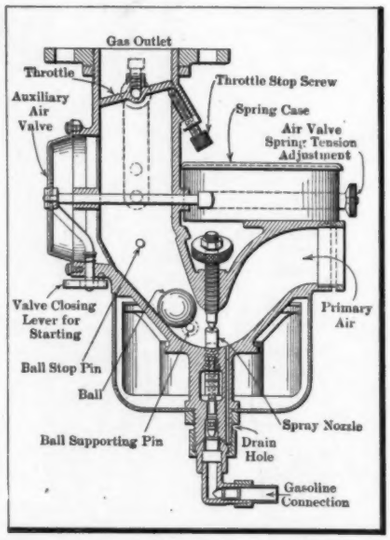


Fig. 2—Cross section of the Excelsior carbureter

ELECTRIC LIGHTING SWITCHES

The new electric light switch as shown in Fig. 3 has an air of stability that recommends it to the automobilist of discrimination. This switch is manufactured by the Leece-Neville Co., of Cleveland, Ohio, and, as the illustration shows, it provides for all contingencies. The switch may be thrown in the "off" position, or the "tail-light only" may be connected up, and there are three combinations in addition to these, namely, tail and side lights, all lights, and tail and headlights. There is also a connecting plug by means of which a portable lamp may be thrown in so that the automobilist may quickly throw light upon any part of the car and the lamp with its holder, being provided with a guard, may be handled even carelessly without fear of damage.

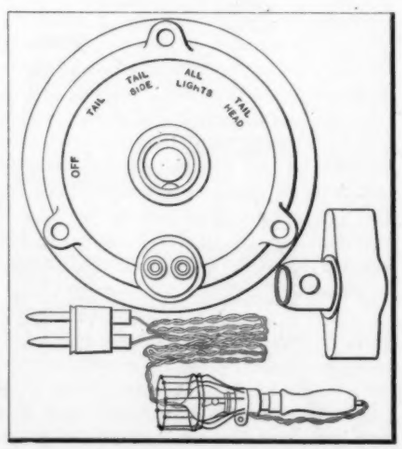


Fig. 3—The Leece-Neville electric lighting switch